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Transportation of Hazardous Materials: **State and Local Activities**

A Special Report

CONGRESS OF THE UNITED STATES
Office of Technology Assessment
Washington, D. C. 20510

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Foreword

First passed in 1974 and largely unchanged for the past decade, the Hazardous Materials Transportation Act must be reauthorized by Congress in 1986. During the past dozen years, the transportation industries have been deregulated, the U.S. economy has weathered a major recession and recovered in a new and different form, and public awareness of possible damage from hazardous materials has been heightened by such events as the San Francisco Caldecott Tunnel fire and the thousands of deaths and injuries in Bhopal, India.

At present, no one knows for certain the total quantities and types of hazardous materials that are transported, confusion exists over how safe the transportation process is or ought to be, the public needs better information, and emergency response personnel need training. In light of these and other factors, the Senate Committee on Commerce, Science, and Transportation requested the Office of Technology Assessment to undertake a study of the transportation of hazardous materials. The study results will be presented in two documents. This special report, *Transportation of Hazardous Materials: State and Local Activities*, is the first of the two. It summarizes Federal programs and identifies three major areas of State and local government concern: prevention and enforcement activities, emergency response and training, and planning and data gathering. The report outlines related issues, describes methods by which jurisdictions are responding to them, and documents the concerns that the Federal Government could address. The second document will be submitted to Congress in mid-1986.

OTA is pleased to provide this special report, which should be of substantial value to Congress, as well as to State and local officials and hazardous materials personnel.

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Chapter 1

Introduction and Findings

Chapter 1

Introduction and Findings

Each year, more than 4 billion tons of hazardous products and waste are transported throughout the United States.* The safe handling and carriage of these materials—which include explosives, flammables, corrosive or toxic chemicals, poisons, spent reactor fuel and low-level waste, and disease-causing biological agents—are of major concern to Federal, State, and local agencies charged with public safety and to the industries that produce, ship, and use hazardous materials.**

The safe and efficient transport of hazardous materials depends on three principal activities: accident prevention (including regulation and enforcement), emergency response when accidents occur, and research and planning. While emergency response activities arouse the most intense public interest, all three activities are interdependent and necessary. Maintaining transport safety and efficiency is technologically demanding—a task made complex by the variety and volume of materials transported and by the interlocking responsibilities of Federal, State, and local governments and the multitude of private firms involved.***

Historically, the Federal Government has taken a lead role in regulation of hazardous materials transportation and safety enforcement. State and local governments, however, are assuming greater responsibilities in this area, prompted by a growing awareness of the dangers posed by hazardous materials transportation and recognition that emergency response—at least initially—almost always falls to State and local agencies. The Senate Committee on Commerce, Science, and Transportation, mindful of heightened public concern about chemical spills and accidents involving radioactive materials and toxic substances, requested that the Office of Technology Assessment (OTA) undertake a study of hazardous materials transportation. The study, directed specifically at the issues of container technology, accident data collection and recordkeeping, and training programs for personnel involved in hazardous materials transportation or in emergency response to hazardous materials accidents, will be completed in early 1986. This review of State and local activities provides background information for analysis of the issues to be addressed in the larger study.

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*This estimate includes hazardous materials carried in pipelines.

**Hazardous materials are substances or matter transported in commerce that pose risks to human safety, property, and the environment if accidentally released. Hazardous materials transported by pipeline or generated or used in military or other defense-related activities are similar in nature and pose similar risks but are excluded from this discussion.

***This document summarizes Federal programs and identifies State and local concerns. The OTA Final Report will examine in detail Federal regulations and technical programs and assess the extent to which they meet the needs identified in this report.

HAZARDOUS MATERIALS TRANSPORTATION

Statistics gathered by the Office of Hazardous Materials Transportation (OHMT)* of the U.S. Department of Transportation (DOT) indicate that there are more than 180 million shipments of hazardous materials in the United States each year. The variety of these substances is enormous and growing. Currently, more than 2,400 substances are listed in the Federal Code of Regulations as hazardous commodities; many of the more than 70,000 chemical products on the market today have not been reviewed for inclusion.[1]

Chemical products are but one kind of hazardous material. There are also biological products, fuels, petroleum products, explosives, acids, fertilizers, gaseous substances, and various forms of industrial waste. Radioactive substances are another major form of hazardous materials. More than 20,000 medical and academic institutions, laboratories, government agencies, industrial enterprises, and utilities operating nuclear powerplants generate low-level radioactive waste, amounting to an annual volume of 77,000 cubic meters and containing 500,000 curies of radioactive material.[2] A recent study by the Department of Energy (DOE) projects that this volume could double by 1990.[3] These figures do not include the high-level radioactive waste now shipped by utilities, the Department of Defense (DOD), and DOE. They also do not include the increased high-level radioactive commercial waste that will be shipped in the late 1990s once Federal storage facilities have been established or the low-level waste that will be generated as present nuclear reactors are decommissioned and dismantled. According to a recent estimate, the remains from decommissioning a single large reactor would fill well over 1,000 trucks, equaling one-quarter of all the low-level nuclear waste now generated yearly in the United States.[4]

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*Until Nov. 1, 1985, OHMT was called the Materials Transportation Bureau (MTB); OHMT is a part of the DOT's Research and Special Programs Administration.

[1] See 49 CFR 172.101.

All of these hazardous materials move by land, sea, and air modes of transportation at a rate of about 500,000 shipments per day. Truck transport accounts for about half of all hazardous materials shipments. The types of vehicles carrying hazardous materials on the Nation's highways range from tank trucks, bulk cargo carriers, and other specially designed mobile containers to conventional tractor-trailers and flat beds that carry packages, cylinders, drums, and other small containers. Rail shipments (equaling about 80 million tons a year) are commonly bulk commodities, such as liquid or gaseous chemicals and fuels, carried in tank cars. Most hazardous materials transported by barge on inland waterways are also bulk cargo. The Corps of Engineers estimates that the total inland waterborne volume is approximately 60 million tons a year. Coastal and inland waterborne volumes, combined, reach 550 million tons annually. DOT estimates that about 600,000 vehicles and vessels are regularly used to transport hazardous materials in bulk, and 700,000 carry portable containers. The transport of hazardous materials by air (either in all-cargo aircraft or in belly compartments of passenger aircraft) is insignificant in tonnage—an estimated 175,000 tons annually—but constitutes a high number of shipments. A 1980 Federal Aviation Administration study found that roughly 5 percent of air cargo at 39 major airports (amounting to 300,000 packages) contained hazardous materials, typically rather small parcels of high-value or time-critical material.

The safety record of hazardous materials carriers, as reported to the Office of Hazardous Materials Transportation, is summarized in table 1-1. For the period 1973-83, there was an annual average of 11,462 reported incidents—a rate of 1.25 incidents per 10,000 shipments.* Most of these were accidental releases during handling and loading and not vehicle accidents en route. The reported deaths and injuries caused by exposure to hazardous materials are similarly low, equaling about two fatalities per 1,000 incidents, a result both of the regulations governing hazardous materials transportation and the degree of care exercised by shippers, carriers, and others involved in accident prevention and response.** The

Table 1-1.—Incidents Involving Transport of Hazardous Materials, 1973-83 (as reported to DOT)

Mode	Annual average			
	Incidents	Deaths	Injuries	Damages[a] (millions of dollars)
Highway	10,289	19.3	419.2	$ 8.15
Rail[b]	975	4.0	221.8	4.67
Water	26	0	3.3	0.07
Air	150	0.4	9.0	0.43
Freight forwarder	2	0	1.9	(c)
Other	20	0	7.8	0.01
Total	11,462	23.7	663.0	$13.33

[a] Property damage estimates reported to MTB within 15 days after an accident.
[b] The rail safety record improved during the period because of an increase in the number of Federal rail inspectors and equipment improvements during the early 1980s.
[c] Less than $0.01 million.

SOURCE: U.S. Department of Transportation, Materials Transportation Bureau, *Annual Report on Hazardous Materials Transportation, Calendar Year 1983.*

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*These figures are for incidents *reported* to OHMT. Some experts estimate there may be as many as three to four times as many incidents that are unreported.

**In recent years, there has been an annual average of 24 deaths and 663 injuries in hazardous materials accidents reported to DOT. Even taking into account evidence of incomplete data, to be addressed in OTA's Final Report, the death and injury toll in automobile accidents in the same period was 2,000 times greater.

[2] Under the present classification system, low-level waste includes dry trash; used equipment; and solidified and absorbed liquids, gases, and sludges. Items range from spent resins from ion-exchange processes, filter materials, lubricating oils, and contaminated tools, clothing, and packaging (all of which have relatively low levels of radioactivity); to sealed sources such as Cobalt 60 for radiation treatments; to irradiated reactor components such as in-core instrumentation and control rods (which typically have higher levels of radioactivity). Taylor Moore, "The Great State of Uncertainty in Low-Level Waste Disposal," The Electric Power Research Institute (EPRI) Journal, March 1985, p. 24.

[3] U.S. Department of Energy, *Spent Fuel and Radioactive Waste: Inventories, Projections and Characteristics*, DOE/RW-0006 (Washington, DC: September 1984).

[4] Steve Olson, "Nuclear Undertakers," *Science 84*, vol. 5, No. 7, September 1984, p. 57.

true costs of hazardous materials accidents are difficult to determine. A large number of incidents are not reported to OHMT, and the costs of those that are appear to be greatly underestimated. Interstate carriers are required to report any spill except those of certain consumer goods and paints and batteries to DOT within 15 days, usually long before full costs are known. Typically, carriers report only their direct costs. The annual damage cost for incidents reported to OHMT from 1973 to 1983 was $13 million. This figure is undoubtedly too low, perhaps by a factor of as much as 10,[5] if all costs associated with hazardous materials accidents are considered, including long-term cleanup costs.

Still, it is the risk of death and injury that causes the deepest concern. Hazardous materials accidents are often spectacular, although loss of life is relatively rare. No State or local official can erase the memory of an overturned load of explosives or tanker of chemicals in an area for which he or she is responsible. These experiences and the almost weekly news reports of a hazardous materials spill somewhere in the Nation, more than the official statistical record, drive the demand for strong enforcement of safety rules and improved emergency response capabilities.

Photo credit: Research and Special Programs Administration, DOT

The remains of a truck that had been carrying chemicals, after an accident.

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[5] An OTA contractor studying accident report data has found that DOT damage reports are consistently low. For example, the National Transportation Safety Board (NTSB) listed damages of $597,000 for a February 1978 rail accident; the DOT report of the accident listed damages of $11,000. For a May 1983 rail hazardous materials accident, NTSB records showed $570,000 damages; DOT records did not show the accident at all.

Mark Abkowitz and George F. List, "Hazardous Materials Transportation: Commodity Flow and Information Systems," report prepared for U.S. Congress, Office of Technology Assessment, December 1985.

GOVERNMENT AND INDUSTRY ROLES

Federal

The Federal Government has four roles with regard to hazardous materials transportation: regulation, enforcement, emergency response and planning, and data collection. Responsibility for these functions is distributed among numerous departments and agencies. The departments and agencies operate under a complex set of agreements and coordination procedures, with no single agency having sole responsibility or authority over all aspects of hazardous materials production, shipment preparation, and transportation. In some instances, jurisdictions overlap. In others, responsibility is assigned depending on the type of material involved, the mode of transport, or the nature of Federal regulation.

DOT is the designated lead agency for establishment and enforcement of regulations regarding safe transportation of hazardous materials. The DOT Research and Special Programs Administration (RSPA) has authority to issue regulations on most aspects of hazardous materials transportation containers. It must coordinate with the modal administrations, the Federal Highway Administration, the Federal Railroad Administration, the Federal Aviation Administration, the National Highway Traffic Safety Administration, and the U.S. Coast Guard, which have authority over the vehicles or vessels themselves. This intra-agency fragmentation notwithstanding, DOT as an agency is responsible for identification of hazardous materials, regulation of hazardous materials containers, handling and shipments, development of standards and testing procedures, inspection and enforcement, and data collection.

Another group of agencies—DOE, DOD, the Nuclear Regulatory Commission (NRC), and the Environmental Protection Agency (EPA)—has jurisdiction over other aspects of hazardous materials transportation. DOE is largely concerned with fuels; DOD, with materials used for military purposes. NRC has jurisdiction over high-level radioactive substances in the civil sector, while EPA has responsibilities for chemicals and hazardous nonnuclear wastes. These agencies also undertake training activities and safety awareness programs, and provide technical support for State and local governments.

The Federal Emergency Management Agency is responsible for coordinating Federal assistance, planning, and training activities for emergency response with State and local governments. The Departments of Justice and Labor also have designated responsibilities and areas of interest.

The data collection function similarly is spread among several Federal agencies. The various databases maintained by those agencies record accidents and spills and monitor compliance and sometimes carrier performance. OHMT is the principal agency collecting data on hazardous materials transportation spills, but every other Federal entity keeps records pertaining to its area of interest. There is no central clearinghouse to collect and analyze hazardous materials transportation information.

State

The States mirror Federal functions and responsibilities to a degree, but the structure is by no means uniform or even comparable from State to State. Some States have extensive programs of regulation, enforcement, emergency planning, and training. In others, programs are still in a formative stage. The functions and activities listed in table 1-2 indicate the range and nature of State involvement, not the situation in every State. State programs, like their Federal counterparts, are characterized by a multiplicity and diversity of activities and areas of jurisdiction, complicated in many instances by differences between Federal and State agencies as to definitions of hazardous materials, regulatory requirements, transportation restrictions, and stringency of enforcement.

Regulatory activities are a major feature of many State programs. State regulations may require licensing or registration of hazardous materials transporters, imposition of fees and taxes (often as an extension of the licensing function), prenotification, and routing restrictions. States also maintain inspection and enforcement programs and may require special safety procedures.

Other important State functions are planning and training for emergency preparedness and response. Training is conducted in cooperation with local

Table 1-2.—Hazardous Materials Assistance Commonly Available From State and Local Agencies

State:

Civil Defense: Communications, coordination, evacuation, radiological monitoring.
State Police: Traffic control, communications, evacuation.
Environmental: Chemists, environmental scientist meteorologists, lab services, some equipment, knowledge of contractors.
Public Works: Construction equipment and operators.
Public Health: Health specialists.
Agriculture: Pesticide and/or fertilizer experts.
Fire Marshal or Fire Academy: Fire suppression advice.

Local:

Fire Department: Trained firefighters and specialized equipment for: 1) suppressing fires, 2) rescuing injured or trapped persons and 3) dealing with select hazardous materials.
Public Works: Equipment and personnel to contain spills by digging trenches or constructing dikes. Can usually provide sand—an excellent sorbent for spilled hazardous materials.
Police: Communications equipment and traffic/crime control at scene of spill.
Civil Defense: Equipment for monitoring radioactivity. Will usually coordinate the response of various agencies.
Public Health Agency: Advice on the chemical properties of the materials and human health effects.

SOURCE: U.S. Department of Transportation, Research and Special Programs Administrator, *Community Teamwork: Working Together to Promote Hazardous Materials Transportation Safety: A Guide for Local Officials*, May 1983, p. 58.

agencies and often with some technical assistance and financial support from the Federal Government and industry. Since States are also responsible for emergency programs, civil defense, police, fire, environmental, and public works agencies may all play roles in State hazardous materials activities, making program coordination difficult. In rural areas and small towns, State agencies may constitute the first response team.* In metropolitan areas, local governments usually assume this function.

Local

Diversity of function and concern also exists at the regional and local levels of government. Some major cities and metropolitan areas exercise regulatory, inspection, enforcement, and licensing functions akin to those of Federal and State agencies. Many have undertaken emergency planning and training activities, either on their own or with assistance from Federal and State hazardous materials offices. The most important and most nearly universal local function, however, is emergency response.

Almost 75 percent of the U.S. population lives in metropolitan areas, where the majority of hazardous materials are produced, transported, and used. Local fire and police departments constitute the first line of response in the event of a hazardous materials accident, and local hospitals and health officials bear the brunt of treating accident victims. Local resources are also the first used to prevent the spread of contamination or to evacuate the area around an accident site.

The diversity of local functions is equaled by a wide range of capabilities. Some locales have well-developed emergency plans, adequately trained and equipped response teams, and sufficient resources for hazardous materials containment and cleanup. Others, particularly small urban and rural jurisdictions, must rely on local fire and police departments that most often have little or no training or experience in dealing with hazardous materials.

Industry

An important adjunct to Federal, State, and local government resources are the safety-related programs and capabilities of the industries that produce and transport hazardous materials. Some of the more than 50 national industry associations are made up of hazardous materials producers and users —e.g., the Chemical Manufacturers Association, the National Agricultural Chemicals Association, and the American Petroleum Institute. Others are transportation associations such as the American Trucking Associations, the American Waterways Operators, the Association of American Railroads, and the Air Transport Association.

Industry programs provide employee, client, and contractor training in the handling and transport of hazardous materials and in emergency response. Some industries maintain special response teams to aid State and local authorities at an accident site; others offer funding for training and equipping State and local first response teams. Industry associations and individual firms also contribute to State and local planning, prevention, and education efforts, either by underwriting part of the cost of such programs or by providing technical support. Voluntary standard setting in support of hazardous materials safety varies widely from company to company.

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*First responders are those agencies, such as police or fire, that are called initially when an accident involving hazardous materials occurs. They may be followed by State and local health authorities and environmental cleanup crews.

ORGANIZATION AND SCOPE OF REPORT

This special report, which documents findings pertaining to State and local activities, is the outgrowth of an OTA workshop held on May 30, 1985, and a series of meetings between OTA and government, industry, and academic experts on hazardous materials. The workshop examined the results of OTA's initial research and literature review of State and local capabilities and activities in the areas of accident prevention and emergency response. The comments of workshop participants, supplemented by follow-up interviews and analysis of key points by OTA staff and an extensive review process, form the basis for the material and findings presented here.

Concerns of State and local governments about the transportation of hazardous materials focus on accident prevention and enforcement, emergency response, and collection of information to support planning for emergency preparedness. OTA found that while a hazardous materials accident in any mode of transportation will involve State and local public safety officers, highway and rail hazardous materials accidents tend to concern public officials the most. No other public organization, such as a port authority or the Coast Guard, is likely to be available to provide immediate assistance to State and local public safety personnel for either truck or rail accidents.

This report will emphasize truck transportation because it is of greatest concern to State and local officials. Trucks carry more hazardous materials than any other mode of transportation, and there are many more trucks than other vehicles or vessels carrying hazardous materials. Finally, trucks travel on public rights of way through every jurisdiction, mingling with other traffic and thus increasing spill and accident risks.

Three subjects are addressed in the chapters that follow:

- State prevention and enforcement programs;
- emergency response training, planning, and implementation; and
- information collection for State and local planning.

General findings are presented below. Detailed findings and supporting material are contained in each chapter. It should be noted that the findings presented in this special report will be considered in the context of Federal programs and other resources in a second OTA report to Congress, *Transportation of Hazardous Materials.* The second report will include policy options for consideration by Congress in 1986.

GENERAL FINDINGS

Financial assistance for enforcement and response training and planning activities is needed by many localities. Potential sources of funds include Federal, State, or local assistance, cooperative programs with industry, and registration or user fees.

Movements of gasoline and petroleum products, by far the most frequently transported hazardous materials,* account for more hazardous materials transportation accidents, injuries, and damage than transport of any of the other classified commodities. State and local enforcement, emergency response, and planning personnel should focus on this problem in cooperation with industry representatives. Attention should be given to developing additional safety measures and programs to promote better awareness and training of drivers, handlers, and enforcement personnel. Generally, emergency response personnel are already trained to handle gasoline incidents.

State and local enforcement and emergency response personnel are dissatisfied with the information accompanying hazardous materials shipments. Placarding requirements should more accurately reflect the degree of hazard of the material, and shipping papers should include more information on the nature of the hazard posed and accident mitigation techniques.

Prevention and Enforcement

National standards establishing uniform State hazardous materials requirements and regulations would simplify and improve compliance by shippers, carriers, and State and local enforcement

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*According to data provided by the American Petroleum Association and OTA calculations, these products comprise about 50 percent of total hazardous materials movements.

activities. State, regional, and local agency concerns as well as those of industry should be considered in formulating standards. The areas where uniformity is most needed are:

- **Licensing** to ensure that drivers and others handling hazardous materials are qualified and have been properly trained. Some form of a national truck driver's license is favored by many State, local, and industry officials.
- **Permit or registration requirements** to obtain information and collect fees in a coordinated manner that does not unduly burden transporters and ensures that money collected is used to meet related needs.
- **Shipment notification systems** that provide useful information for localities without unduly burdening carriers.

Penalties for regulatory violations, including failure to report hazardous materials incidents, should be consistent across governmental and jurisdictional levels and sufficiently large to discourage future infractions. An effective enforcement program requires that legislatures, enforcement agencies, and courts be aware of the death, injury, property damage, and environmental harm that could result from accidental release of hazardous materials and set penalties accordingly.

State and local enforcement personnel need additional training and current information on hazardous materials regulations for all modes of transportation. Methods used by the Federal Government to deliver this information to State and local officials need to be improved and strengthened. Programs to educate shippers and carriers on safety measures and regulatory compliance need strengthening as well.

Emergency Response

An effective way to deliver hazardous materials training to first responders is the most pressing national need in emergency response. Many different and successful training programs exist, but they are not reaching sufficient numbers of first responders, especially in the smaller urban and rural areas. Moreover, some training programs are simply inadequate.

Maintaining existing response programs through refresher training and training of new personnel to fill vacancies created by turnovers in response teams is financially difficult for most jurisdictions.

National guidelines for different levels of training and national certification standards for responders are needed. Advanced hazardous materials training is appropriate for personnel in large jurisdictions, along major transportation corridors, or in States with heavy concentrations of hazardous materials industries. The numerous existing training programs need to be systematically examined and evaluated.

National equipment guidelines for emergency response are needed to assist response organizations in equipment selection.

When formulating hazardous materials emergency response plans, communities should consider formal, written mutual aid agreements with regional and adjacent local jurisdictions and Good Samaritan laws to protect first responders from liability when they respond to incidents for which they are not responsible.

Planning and Data Collection

Improved data on hazardous materials storage and commodity flow is needed by State and local governments for analyzing accident prevention techniques such as routing and planning for emergency response. Federal databases pertaining to commodity flow are kept by a wide variety of Federal agencies, but the agencies do not use the same commodity identification codes, and the databases are not interactive. The data are not useful to State and local governments, some of which have undertaken data collection on their own. Data collection efforts would be improved by coordinating existing Federal data resources and providing State and local access to them. National guidelines on hazard assessment data collection for local government would also be valuable. In the absence of national legislation, right-to-know laws should be considered by jurisdictions. Such laws are an important aid in gathering information on the identities and associated hazards of the chemicals most likely to be encountered.

A reliable, comprehensive Federal accident record system is essential. Current Federal efforts are too fragmented to be useful to State and local agencies, or to carriers, which could use the findings to develop or modify their own safety programs. Existing Federal databases that record data on accidents, violations, and shippers and carriers that do not comply with regulations would be more useful if they were interactive and were made accessible to State enforcement personnel. The SAFETYNET Program, being developed by the Federal Highway Administration, and the National Driver's License Registry, being developed by the National Highway Traffic Safety Administration, should help, but their full implementation is at least a decade away.

A more clearly defined and smoothly functioning Federal authority for hazardous materials transportation is needed. The current designation of DOT as lead agency and RSPA as lead group within DOT has not resulted in clear lines of authority or intermodal coordination for transporting hazardous and radioactive commodities and wastes. While a number of federally sponsored activities have made important contributions to the development of municipal and State programs, the absence of effective Federal program coordination means that jurisdictions have difficulty gaining access to available information, planning, and financial resources.

The lack of interagency coordination at the Federal level is often replicated at the State level, compounding the difficulties of regional and local jurisdictions.

Up-to-date technical information is needed for planning emergency response. Current toxicological, chemical, and health data should be compiled, updated regularly, and made accessible to planners and responders.

State and local officials are concerned about shipments of chemical weapons and explosives or radioactive materials by DOD and DOE. While these officials understand the need for secrecy about such shipments, they seek guarantees that Federal enforcement will be stronger and when an accident occurs, emergency response efforts will be adequate.

Chapter 2

Prevention and Enforcement

Chapter 2

Prevention and Enforcement

Federal, State, and local governments share responsibility for the safe transport of hazardous materials and the prevention and control of accidents involving hazardous materials. The preeminent authority is the Federal Government, which issues regulations and sets standards governing identification and classification of hazardous materials, the design and performance of containers and equipment, and procedures for handling and transporting hazardous materials. Federal regulations also prescribe documentation of hazardous materials shipments and specify requirements for labels and placards. State prevention programs concentrate on inspection and enforcement within the framework of Federal regulations, although some States also issue regulations intended to supplement or strengthen Federal requirements, principally with respect to truck routing and notification of hazardous materials shipments. Local agencies are primarily concerned with emergency response, but they also play a role in prevention and enforcement by placing restrictions on routes and hours of hazardous materials transport and by requiring registration and permits for hazardous materials shippers and carriers operating within their jurisdictions.

In recent years, largely as a result of programs initiated and funded by the Department of Transportation (DOT), many States and local agencies have added to their regulatory authority and strengthened administrative, enforcement, and inspection procedures. They have also established or improved programs to train highway enforcement officers and to educate shippers and carriers about compliance with hazardous materials regulations.

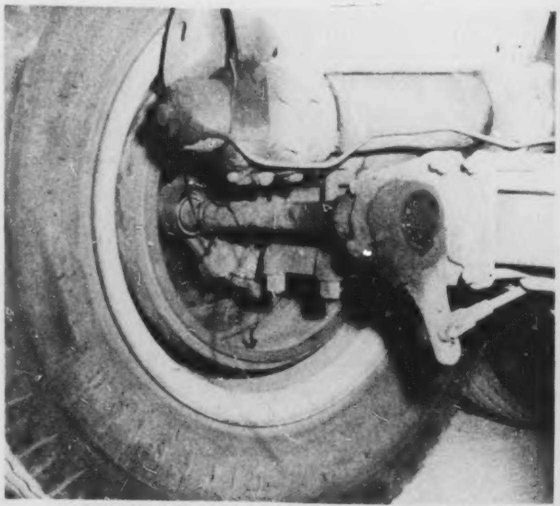

Photo credit: Research and Special Programs Administration, DOT

An accident waiting to happen—inadequate brake repair discovered during truck inspection.

This chapter reviews State and local prevention and enforcement programs that have evolved over the past 15 years and examines current State and local activities. It also discusses Federal agencies and policies affecting the capability and performance of State and local agencies. The principal sources of information for this chapter are reports filed by States participating in federally funded prevention and enforcement activities, proceedings of recent State and regional conferences on hazardous materials transportation, interviews with officials of Federal and State agencies, and an OTA workshop.

FEDERAL RESPONSIBILITIES

The Federal Government has broad and diverse authority over hazardous materials transportation. This authority is distributed among 12 different Federal agencies with regulatory or administrative responsibility for some aspect of prevention and enforcement (see table 2-1). The activities of DOT and the Nuclear Regulatory Commission (NRC) are of chief interest here since, to a large extent, they determine the context in which State and local agencies operate.

Table 2-1.—Federal Activities in Hazardous Materials Transportation

	Regulation of:									
	Hazardous materials†	Containers	Vehicles and vessels	Drivers	Planning	Recordkeeping	Inspection	Enforcement	Training	Emergency response
DOT									X	
OHMT	X	X				X	X	X		
FHWA		X[a]	X			X	X	X		
BMCS				X						
NHTSA			X							
FRA		X[a]	X			X	X	X		
FAA		X[a]	X			X	X	X		
USCG	X	X[a]	X			X	X	X	X	X
FEMA					X				X	X
EPA	X					X	X	X	X	X[b]
NRC	X	X						X	X	X[c]
DOE	X[d]	X				X	X	X	X	X[c]
DOD	X[d]			X		X	X	X		

†This category includes hazardous substances, hazardous wastes and radioactive materials, and the tools for communication of those hazards such as shipping papers, placarding, and marking.
[a] Package/container design.
[b] EPA responds to accidents involving the release of products regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and oil spills in coastal and ocean water.
[c] Depends on the type of radioactive material, severity of the accident, and the adequacy of State and local response programs.
[d] In cases of national security, DOD and DOE are not required to comply with DOT regulations provided they follow standards affording equal protection.

KEY: DOT—Department of Transportation; OHMT—Office of Hazardous Materials Transportation; FHWA—Federal Highway Administration; BMCS—Bureau of Motor Carrier Safety; NHTSA—National Highway Traffic Safety Administration; FRA—Federal Railroad Administration; FAA—Federal Aviation Administration; USCG—United States Coast Guard; EPA—Environmental Protection Agency; NRC—Nuclear Regulatory Commission; DOE—Department of Energy; DOD—Department of Defense.

SOURCE: Office of Technology Assessment.

Regulation of hazardous materials transportation by DOT is vested in five agencies: the Office of Hazardous Materials Transportation (OHMT), of the Research and Special Programs Administration, which is responsible for promulgating and enforcing regulations and coordinating the hazardous materials activities of DOT, and the four modal administrations charged with inspection and enforcement of hazardous materials transport by highway, rail, air, and water.

OHMT has general authority over all hazardous materials transportation regulation, except bulk shipment by ship or barge, which has been delegated to the U.S. Coast Guard. OHMT issues regulations designating and classifying hazardous materials, prescribing safety standards for containers, establishing requirements for labels and placards, and specifying handling, stowing, and other in-transit requirements for hazardous materials.[1] Another major OHMT activity has been administration of the State Hazardous Materials Enforcement Development Program, a cooperative program to strengthen State regulatory enforcement capabilities.

The Bureau of Motor Carrier Safety (BMCS) within the Federal Highway Administration (FHWA) is responsible for inspection and enforcement activities in highway transportation of hazardous materials and at depots and transshipment points.[2] BMCS, under its general authority to set motor carrier safety standards, also regulates vehicles used in transporting hazardous materials.[3] In addition, BMCS administers the Motor Carrier Safety Assistance Program, which provides some financial assistance to States for enforcement of regulations governing hazardous materials transportation on public roads.*

The Federal Railroad Administration (FRA) enforces regulations pertaining to hazardous materials carried by rail or held in depots and freight yards.[4] The Federal Aviation Administration has authority over shipments of hazardous materials on domestic and foreign carriers operating at U.S. airports and in airport cargo-handling areas.[5] The Coast Guard carries out inspection and enforcement activities in port areas and on domestic and foreign ships and barges operating in the navigable waters of the United States.[6] Responsibility for inspection and enforcement of regulations pertaining to hazardous materials shipments that move by more than one mode of transportation is retained by OHMT.

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[1] Regulations covering classification, shipping, packaging, and placarding of hazardous materials are contained in 49 CFR 171-177. Special routing requirements for hazardous materials, pursuant to the Hazardous Materials Transportation Act of 1974 (49 U.S.C. 1801-1811) have also been issued. OHMT also acts as DOT's liaison with the Environmental Protection Agency (EPA). EPA regulations for transporters of hazardous waste, issued under the authority of the Resource Conservation and Recovery Act, have been adopted by OHMT.

[2] 49 CFR 177 and 49 CFR 1.48.

[3] 49 CFR 350-399.

*MCSAP was created under the 1982 Surface Transportation Assistance Act (Public Law 97-424).

[4] 49 CFR 174 and 49 CFR 1.46.

[5] 49 CFR 175.

[6] 49 CFR 176 and 49 CFR 1.46.

Regulatory authority over transportation of radioactive materials is divided between DOT and NRC under a 1979 Memorandum of Understanding.[7] Under this agreement, NRC sets standards for the design and performance of packages to carry fissile materials and radioactive materials that exceed Type A limits.* Currently NRC certifies all such packages and carries out the necessary inspections. NRC regulations also require that States be given advance notification of the transport of certain types of radioactive materials (including spent fuel)[8] and provide for physical security measures to prevent deliberate acts to seize or damage shipments of strategic nuclear materials and spent fuel.[9] Enforcement of these regulations is carried out by NRC regional offices.

DOT has regulatory authority over the design and performance of packages carrying nonfissile radioactive materials and small quantities of fissile materials that do not exceed Type A limits. In addition, DOT governs the routing of radioactive materials designated as "Highway Route Controlled" for safety purposes.[10]

While OHMT exercises general regulatory responsibility for hazardous materials transportation, most day-to-day inspections and enforcement are carried out by the DOT modal administrations. These activities are often part of their overall programs to monitor compliance with other types of transportation and vehicle safety regulations.

The number of inspections and enforcement actions taken by DOT is small compared with the number of shippers, carriers, and container manufacturers throughout the country. In 1983, for instance, only 109 of the more than 20,000 container manufacturers were inspected by OHMT and FRA. The 1983 figures for shipping facilities are similarly low—5,000 of an estimated 104,000 were inspected.

The principal reason for the low number of inspections is the shortage of DOT personnel, especially those with training in hazardous materials enforcement. Table 2-2 shows the number of full- and

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[7] 44 F.R. 38690, July 2, 1979.

*Fissile material is that containing one or more fissile radionuclides—Plutonium 238, Plutonium 239, Plutonium 241, Uranium 233, and Uranium 235. Neither natural nor depleted Uranium is fissile material. Type A quantity limits are defined in 10 CFR 71.4 and table A-1 thereto.

[8] 10 CFR 71.97 and 73.37.

[9] 10 CFR 73.

[10] 49 CFR 177.825, Docket No. HM-164.

Table 2-2.—Hazardous Materials Transportation Inspectors

	1979	1980	1981	1982	1983
Inspectors (full-time):					
USCG	0	0	0	0	0
FAA	12	12	10	0	10
FHWA	9	9	9	0	8
FRA	19	24	25	23	33
OHMT	9	10	7	6	6
Totals	49	55	51	29	57
Inspectors (part-time):					
USCG	770	770	1,298	403	570
FAA	623	176	155	138	102
FHWA	152	161	153	149	144
FRA	61	64	129	129	158
OHMT	0	0	1	1	1
Totals	1,606	1,171	1,736	820	975
Total work years					
USCG	115.5	115.50	155.76	50.00	40.00
FAA	36.9	19.04	17.75	8.20	14.08
FHWA	47.0	49.25	47.25	40.20	25.28
FRA	28.2	33.60	34.65	33.00	46.40
OHMT	9.0	10.00	7.50	6.75	6.75
Totals	236.6	227.39	262.91	138.15	132.51

KEY: USCG—United States Coast Guard; FAA—Federal Aviation Administration; FHWA—Federal Highway Administration; FRA—Federal Railroad Administration; OHMT—Office of Hazardous Materials Transportation; and work year—equivalent to a full year of work by a single inspector.

SOURCE: Office of Technology Assessment; based on DOT Annual Reports.

Photo credit: Research and Special Programs Administration, DOT

Bottles of sulfuric acid that leaked during transport

part-time inspectors and equivalent years of work (work-years) by agency for 1979-83. With the exception of FRA, all the hazardous materials enforcement agencies in DOT had experienced staff reductions over the 5-year period. The total work-years of inspection and enforcement for all DOT agencies combined has also dropped—237 years in 1979 to 133 in 1983, a decline of almost half.

The number and frequency of hazardous materials shipments; the vast extent of roadways, waterways, and rail lines to be covered; and the variety of materials involved all dictate an inspection and enforcement program of much greater scope than Federal agencies presently offer. Based on the minimal number of inspections that have been carried out, the rate of noncompliance and safety violations is high. The Federal Government in recent years has begun helping the States to strengthen their inspection and enforcement capabilities, particularly for truck transport, since the number of trucks carrying hazardous materials constitutes the largest hazardous materials fleet in any mode. Truck safety inspections have also been a traditional function of State enforcement officers. In the early 1980s, the Federal rail inspection force was increased, and there has been a commensurate improvement in the rail safety record.

STATE ENFORCEMENT AND INSPECTION CAPABILITIES

The entry of State governments into the field of hazardous materials transportation safety began in earnest in the early 1970s. A series of episodes involving radioactive materials prompted States to call for more vigorous efforts to monitor and control the shipment of hazardous materials. Since it was apparent that the resources committed by the Federal Government to police shipments of radioactive material—much less other, more common, forms of hazardous materials—were inadequate, the States themselves began to seek ways to develop inspection and enforcement capabilities. The task was formidable since States then had virtually no organizational structure, legal authority, or personnel with specialized competence in the area of hazardous materials control.

Evolution of State Programs

In 1973, DOT and NRC's predecessor, the Atomic Energy Commission, undertook a program in cooperation with nine States to collect data on the amount and type of radioactive material originating in or passing through selected locations. This effort, known as the State Surveillance of Radioactive Materials Transportation Program (SSRMT), was directed at determining the magnitude of the problem posed by radioactive materials and the degree of regulatory noncompliance by shippers and carriers.

As expected, the SSRMT study found several inadequacies in data collection and recordkeeping; it also pointed to important needs in the area of enforcement:

- Imposition of civil penalties and suspension of permits to use radioactive waste burial sites were needed to reduce violations in the disposal of radioactive material.
- Increased education of handlers and drivers was needed to heighten their safety awareness and to lessen their exposure to radiation.
- Enforcement by police cars equipped with radiation detectors (a program undertaken in Illinois) was found to be especially useful in identifying improperly placarded vehicles.
- Remote surveillance (for example, a geiger-counter mounted on a parked patrol car can detect gamma rays emitted by passing trucks or vehicles) could provide valuable data on shipping patterns and assist in determining the extent of compliance by shippers and carriers.
- Requiring appropriate placarding and shipping documents would provide emergency response personnel with better information in the event of a transportation accident.

In addition, SSRMT pointed out the need to strengthen State-level prevention and enforcement mechanisms for all types of hazardous materials. SSRMT findings thus helped form the basis for a much more substantial Federal program to aid in the development of State hazardous materials safety programs.

State Hazardous Materials Enforcement Development Program

Shortly after the SSRMT study was completed, responsibility for administering Federal-State cooperative programs was transferred to OHMT. Under OHMT, the programs were broadened to include all classes of hazardous materials, and emphasis shifted from data collection to regulatory enforcement, especially development of State organizations that could assume a greater share of inspection and enforcement functions.[11]

In 1981, OHMT initiated a wide-ranging effort to increase State and local capabilities in managing the transportation of hazardous materials. The State Hazardous Materials Enforcement Development Program (SHMED), designed to assist States in the enforcement of hazardous materials safety standards and regulations, primarily those pertaining to highway transportation, was a major component. SHMED had two objectives: decreasing the number of hazardous materials transportation accidents by strengthening State enforcement capabilities and promoting uniformity in State hazardous materials safety regulations and enforcement procedures. SHMED offered participating States contracts to conduct a three-phase program. The first phase, funded at a maximum of $20,000 per State, concentrated on data gathering, passage of enabling legislation, and adoption of Federal regulations. The second phase had a funding limit of $40,000 and required States to develop and implement an inspection program. In the third phase, with funding of up to $60,000, States had to establish enforcement procedures.

In all, 25 States have participated in SHMED (see figure 2-1). Compared to most Federal-State cooperative programs, SHMED is small. The 1984 budget was $1.1 million, and overall expenditures through 1986, when the program expires, will amount to just over $3 million. Nonetheless, it has had a significant influence in shaping State enforcement programs and in defining what constitutes an effective program. While some States, such as New Jersey, have established enforcement programs without SHMED support, the majority of existing State programs have had SHMED funding.

Motor Carrier Safety Assistance Program

When the SHMED program ends this year, Federal support of State multimodal hazardous materials enforcement capabilities will diminish, and there will be no programs specifically targeted to hazardous materials transportation by rail, water, and air. However, Federal funds for State inspection and regulatory enforcement on the highways will be available through the Motor Carrier Safety Assistance Program (MCSAP). Authorized under the Surface Transportation Assistance Act of 1982 (Public Law 97-424), MCSAP makes grants to States for "the development and implementation of programs for enforcement of Federal rules, regulations, stand-

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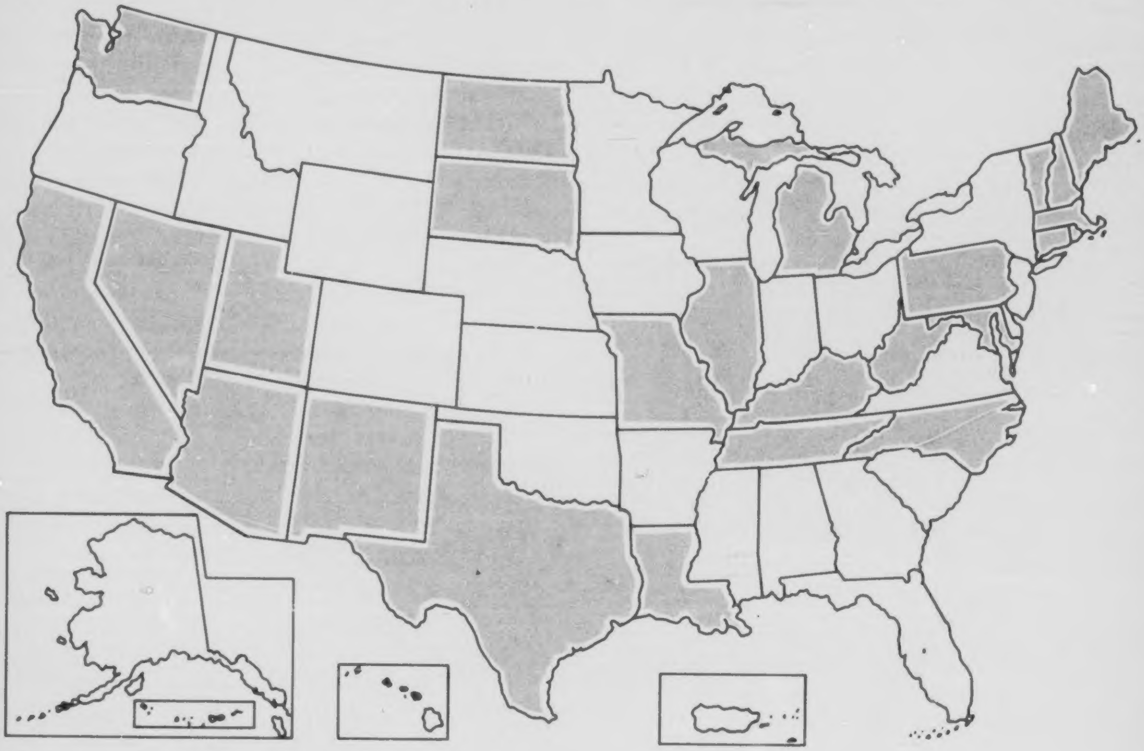
[11] Steve N. Solomon, *State Surveillance of Radioactive Materials Transportation: Final Report*, NUREG-1015 (Washington, DC: U.S. Nuclear Regulatory Commission, Office of State Programs, 1984).

Figure 2-1.—States Participating in the State Hazardous Materials Enforcement Development Program



Key:

▨ States participating in the State Hazardous Materials Enforcement Development (SHMED) Program.

☐ States not participating in the State Hazardous Materials Enforcement Development (SHMED) Program.

SOURCE: Office of Technology Assessment.

ards, and orders applicable to commercial motor vehicle safety and compatible State rules, regulations, standards, and orders." MCSAP covers all aspects of truck safety, and the act specifically indicates that it may apply to enforcement of rules pertaining to vehicles used to transport hazardous commodities.

MCSAP is financed through the Highway Trust Fund under a 5-year authorization: $10 million was authorized for fiscal year 1984, and $10 million was to be added each year up to a maximum of $50 million by fiscal year 1988. The Federal grants were to be matched by States on an 80:20 basis. To date, actual appropriations have been significantly lower.

Under MCSAP, States may apply for two types of grants. Development grants, available for a maximum of 3 years, provide funding for States needing to establish or substantially modify an enforcement program. Implementation grants provide funding for States ready to initiate or continue established enforcement programs. To qualify for an implementation grant, a State must:

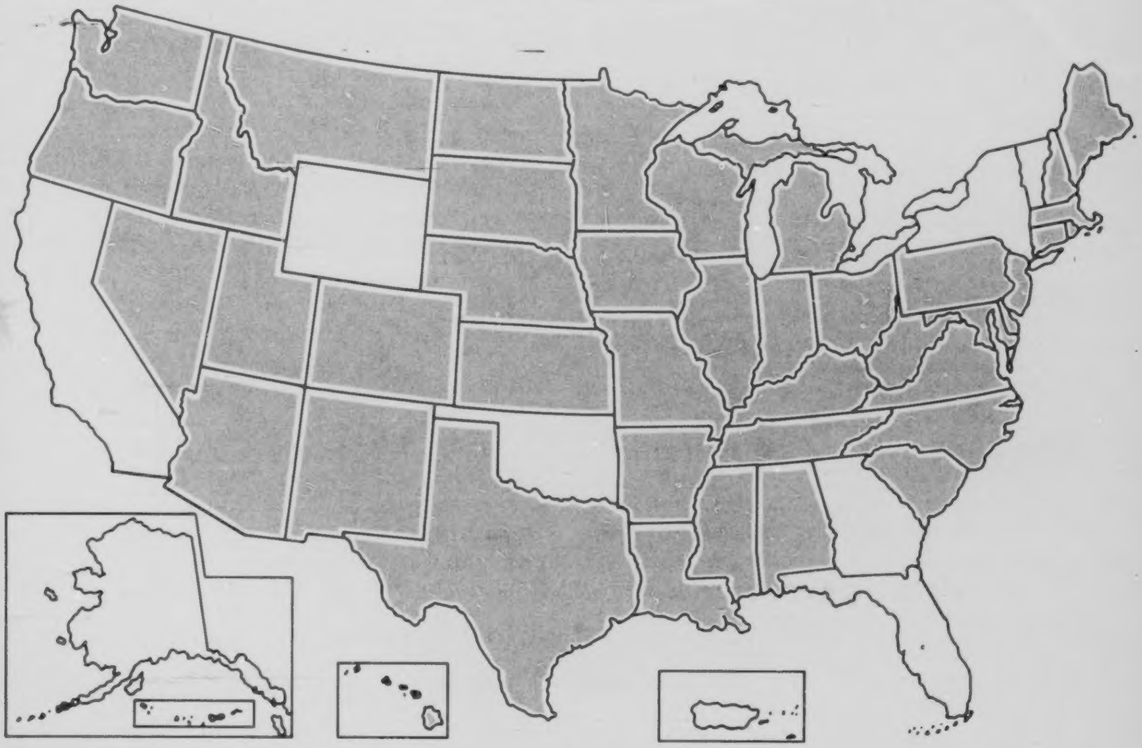
- agree to adopt and enforce the Federal Motor Carrier Safety Regulations (49 CFR Parts 390-399, including highway-related portions of the Federal Hazardous Materials Regulations) or compatible State rules;
- submit an enforcement and safety program plan and designate a lead agency for administering the plan;
- agree to devote adequate resources to administration of the program and enforcement of rules, regulations, standards, and orders; and

- have established statutory authority for right of entry into vehicles and facilities.

The MCSAP grant program, administered by the Bureau of Motor Carrier Safety or FHWA, is designed to improve State capabilities to enforce motor carrier safety regulations and to enable States to increase safety inspections of intrastate and interstate commercial vehicles. The development of an accurate database on compliance with safety regulations is a secondary goal of MCSAP, and funds may be used for data collection, storage, and analysis. The legislation also authorizes inspections (including hazardous materials inspections) of commercial vehicles in terminals and along highways. The projected total amount of development and implementation grants under MCSAP is more than $14.6 million for 1985. Figure 2-2 shows the States participating in MCSAP.

State officials committed to expanding hazardous materials enforcement have expressed concern that MCSAP may give priority to general motor carrier safety programs and that hazardous materials enforcement activities—especially those for nonhighway modes—will be slighted. The State lead agencies for MCSAP are generally highway-oriented and often are not the lead agencies designated by the State for the SHMED program. However, at least one State, Indiana, which did not completely adopt 49 CFR until January 1985 and did not participate in the SHMED program, has used MCSAP funds

Figure 2-2.—States Participating in the Motor Carrier Safety Assistance Program, August 1985



Key:

States participating in the Motor Carrier Safety Assistance Program (MCSAP). ▨

States not participating in the Motor Carrier Safety Assistance Program (MCSAP). ☐

SOURCE: Office of Technology Assessment.

to train and put into operation hazardous materials inspection teams. Since MCSAP funds are restricted to highway safety purposes, the broader question arises of how States are to develop or improve inspection, regulation, and enforcement for other modes of transportation, because no similar Federal programs exist for water, rail, or air. Although some State inspectors have been trained in rail safety regulations and enforcement procedures, they are not trained to carry out hazardous materials inspections. Particular concern has been expressed by States with high concentrations of nonhighway hazardous materials shipments.

Commercial Vehicle Safety Alliance

In an initiative independent of the Federal Government, 26 States and the Canadian Provinces of Alberta and British Columbia formed the Commercial Vehicle Safety Alliance (CVSA) in 1980. Created under the leadership of California, Idaho, Oregon, and Washington, CVSA seeks to foster interstate cooperation in establishing uniform safety inspection standards for trucks. Under the terms of the Alliance, members agree to use identical inspection standards and out-of-service criteria and to honor the inspections of other jurisdictions. In this way, CVSA hopes to secure greater acceptance of motor carrier inspection programs by the trucking industry and to reduce delays caused by duplicative inspections of interstate truck shipments.

CVSA inspection standards and procedures have been developed in cooperation with BMCS and OHMT. The inspection process concentrates on the critical items (brakes, steering, tires, wheels, couplers, and suspension) most frequently identified as causes of truck accidents. In addition, the driver's qualifications and log book are checked. CVSA has recently added hazardous materials inspection standards and out-of-service criteria to its procedures. On passing inspection by a CVSA jurisdiction, the vehicle receives a decal valid for 3 months allowing it to travel through member States without further inspection unless a readily visible defect is detected. Reciprocity, uniformity, and consistency are the key concepts of the Alliance.

A CVSA associate membership program has recently been formed through which industry members serve in an advisory and nonvoting capacity to contribute their views, experience, and concerns. Since many of the States participating in CVSA are involved in SHMED and MCSAP as well, State agencies and personnel are developing a nationwide program of State-level hazardous materials transportation inspection and enforcement capability. The three organizations now hold joint national and regional meetings. CVSA sees its role as providing a link between Federal and State agencies responsible for motor carrier and hazardous materials inspection and enforcement.

CURRENT STATE ACTIVITIES

Building an effective inspection and enforcement capability at the State level has been a slow process. Ten years ago, few States had the requisite legal authority, organization, or personnel for conducting inspections of hazardous materials shippers and carriers, and enforcing safety rules and regulations. The Federal and State programs described above have helped to develop this capability, and most States now have organizations and programs in various stages of formation or operation. Generally, the process has involved the following steps:

- adopting enabling legislation and regulations,
- developing data collection mechanisms and information networks,
- establishing inspection and enforcement forces, and
- training inspectors.

Adopting Legislation and Regulations

A condition of State participation in MCSAP is that States wishing to participate must first pass legislation adopting Federal motor carrier safety regulations (49 CFR Parts 390-399) and those portions of Federal hazardous materials regulations pertaining to shipments on public highways (49 CFR Parts 171-173 and 177-178). As of August 1985, and sometimes only after lengthy legislative proceedings, all but two States had adopted 49 CFR wholly or in part.

However, despite this strong Federal encouragement for uniform regulations and enforcement policies across all States, great variation from State to State remains, making familiarity with numerous State laws a burdensome necessity for interstate carriers, and development of nationally standardized training difficult. Some States exempt specific commodities, such as agricultural fertilizers; others exclude private carriers from regulation. In Illinois, hazardous materials regulations apply only to quantities that require placarding by Federal law; in South Dakota, shipments of flammable and combustible liquids are exempt.[12]

Data and Information Collection

An important first step for many States has been collecting data on hazardous materials shipments by truck and rail and on the degree of compliance with regulations. These data are used to clarify the nature and extent of the enforcement problem and to support legislative or regulatory actions that may be needed. (Because of the special importance of data collection, this aspect of State programs and the problems that States have encountered with it are treated in detail in chapter 4 of this report.)

Some States gather data on hazardous materials commodity flow by surveying drivers and inspecting trucks at weighing stations or checkpoints along major routes. Such surveys can be expensive and time-consuming, but can provide valuable data to guide enforcement efforts.

However, most States have concentrated on recording data on violations of hazardous materials regulations and do not yet have extensive data collection programs, relying instead on spot checks and reports of violations generated by enforcement agencies. For example, prior to expanding their enforcement programs, Texas and Illinois officials reported that they had no statistics on compliance, but that their experience indicated significant noncompliance by intrastate motor carriers. Massachusetts found that when data collection began under the SHMED program, it was not uncommon to find at least one violation for every truck inspected.[13] States with more advanced enforcement programs are now using computerized data management systems to monitor the effectiveness of their efforts. Utah, Washington, Oregon, and Idaho have established management information systems that make use of data on truck accidents and truck traffic violations collected by the State and BMCS.

California has put in place a hazardous materials registration program and is currently establishing a computerized statewide database and information system, scheduled to be operational in mid-1986. The system consists of a profile of all carriers that currently carry hazardous materials or are likely to become involved in hazardous materials transportation in the State. The profile includes data on licensing, inspection records, citations, and spills. Monthly reports will list all carriers with a hazardous materials license due to expire in 90 days. The reports will be sent to the carrier and to the California Highway Patrol (CHP) along with a copy of each carrier's current profile. The database will also include a record of all highway hazardous materials incidents reported throughout the State. Monthly incident summaries will be issued by highway patrol subarea. The California system will have access to the information systems of BMCS and OHMT.[14]

State data collection capabilities will be further enhanced when an integrated Federal-State data network, known as SAFETYNET, is made operational by BMCS. SAFETYNET will tie together the present BMCS Motor Carrier Safety database with the OHMT Hazardous Material Information System and various computer-based State systems. The Motor Carrier Safety database now contains information on more than 200,000 interstate carriers and 25,000 hazardous materials shippers. It can report all of the known carriers domiciled in a region, rank them by the average number of driver and vehicle violations found per inspection, list the number of truck inspections each carrier has undergone, and give the date of the most recent safety audit. Once SAFETYNET is operating, BMCS and participating States should be able to:

- input driver-vehicle inspection data,

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[12] U.S. Department of Transportation, Materials Transportation Bureau, "State Hazardous Materials Enforcement Development (SHMED) Program Workshop Proceedings," unpublished typescript, 1983, pp. 121 and 183.

[13] Ibid., p. 146.

[14] California Highway Patrol, "SHMED Program System Objectives and Scope," unpublished typescript, 1984, p. 3.

- update and query inspection data,
- update and query carrier census data,
- query safety management audit summary data,
- query accident report summary data,
- query inspection workload data, and
- generate system reports.[15]

A demonstration program involving four States—North Carolina, Colorado, Oregon, and Michigan—is in progress. The eventual goal is to include all States in SAFETYNET, but this may take 10 years or more to accomplish. Funding is to be provided in a variety of ways—through SHMED, MCSAP, other BMCS grants, and State-appropriated monies.

Inspection and Enforcement

In many States, hazardous materials inspection authority is divided among several agencies. Usually, the State highway patrol is charged with roadside inspections, and another agency, such as the Department of Transportation, has authority to conduct inspections of terminals. In addition, a specialized agency may be empowered to inspect carriers of radioactive materials. In an effort to centralize hazardous materials inspections, Maryland has designated the State Police as the only inspection force, with broad powers to stop and inspect vehicles carrying all classes of hazardous materials. Other States, Michigan and Massachusetts, for example, took a similar approach and established specialized units of the State highway patrol that are trained in and solely responsible for hazardous materials inspections.

Systematic, thorough, and consistent inspection procedures are important if the safety of hazardous materials transportation is to be improved. State inspectors who have received training connected with federally sponsored programs generally employ procedures that conform to Federal practice. OHMT has issued a series of inspection guidebooks that contain simplified, standard procedures. Developed with assistance from BMCS and CVSA, the guidebooks cover roadside procedures (stopping vehicles, exterior and interior inspection, putting a vehicle out of service, etc.) and terminal inspection procedures (warrantless entry, review and copying of documents, and seizure of a vehicle or its contents).

Photo credit: Research and Special Programs Administration, DOT

Inadequate blocking and bracing of containers for rail transportation can cause damage and spills.

A 1983 informal survey of States participating in SHMED[16] identified the following as the most common violations found during roadside inspections:

- failure to display the correct placard,
- failure to block or brace hazardous materials containers,
- leaking discharge valves on cargo tanks,
- improperly described hazardous wastes,
- inaccurate or missing shipping papers, and
- excessive radiation levels in the cab of the truck.

Accurate placards and shipping papers are particularly important for the safety of first responders to hazardous materials emergencies, as they provide essential, basic information on the nature of the problems the responders face. State enforcement officials estimate that one-quarter to one-half of all hazardous materials vehicles have improper placards.*

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[15] Ibid., p. 2.

[16] U.S. Department of Transportation, Research and Special Programs Administration, "Quarterly State Hazardous Materials Enforcement Development (SHMED) Program Progress Reports: 1984-85," unpublished reports.

*Estimates received during the course of OTA research. State officials familiar with roadside truck inspections in at least 10 States were asked how many trucks had been found to be incorrectly placarded.

A Virginia Department of Transportation study found the rate to be at least one-third.[17] Improper placarding means that the immediate source of information for first responders will frequently be faulty.

Enforcement policies affect violation rates, and violations are often treated differently from State to State and among different agencies in the same State. In about half of the States, inspectors have enforcement powers and can issue citations for violations. In the other half, inspectors can only report violations to a separate agency empowered to enforce regulations and assess penalties. Some States provide only for civil penalties; others give the enforcing agency the option of civil or criminal penalties depending on the severity of the violation and the violator's record. In some States, the policy is to issue written warnings to first offenders. Other States use more stringent measures; in Texas and Vermont, for instance, any violation of a hazardous materials regulation is automatically a criminal misdemeanor.

Fines for similar violations differ among the States. In South Dakota, where no penalties were specified by the State legislature when Federal regulations were adopted, all violations are automatically treated as petty misdemeanors. Texas has a $200 limit on fines, while Illinois may impose fines of up to $10,000 per day, per violation. Illinois has tried to ensure that similar offenses receive similar fines and has developed a rating system based on a matrix assigning a numerical value from one to five to such factors as the gravity of the violation, the degree of culpability, the history of prior offenses, and the ability to pay. A violator can be assessed up to 40 points, each representing a $250 fine. The accused violator may appeal the fine before an administrative hearing officer who may reduce the penalty or set it aside.[18]

The need for a consistent State enforcement policy is apparent when violations are prosecuted by local city or county attorneys. Local prosecutors and judges often are unfamiliar with hazardous materials regulations and may underestimate the seriousness of the offense or misunderstand the regulations. To improve local prosecution of violators, enforcement officers in some States provide local judges and prosecutors with regularly updated information on the regulations.

Enforcement officers report four problems commonly encountered in prosecuting hazardous materials violators. First, due to a lack of training or experience, officers often do not provide adequate documentation in the inspection report or have not followed correct procedures. As a result, many cases must be set aside or the charges reduced. Second, enforcement officers find that many judges and local prosecutors have difficulty understanding hazardous materials regulations and respond by dismissing cases or lowering penalties without cause. A third problem is in obtaining assistance from other agencies in preparing evidence for court proceedings. State agencies are sometimes unwilling to cooperate in testing hazardous materials or in providing other technical assistance. In some instances, State facilities may be willing to help, but they cannot provide certain kinds of tests or technical analysis, or they cannot do so in a timely manner.[19] Fourth, State enforcement agencies complain that fines are too low to serve as a deterrent to noncompliance. Many carriers and shippers treat fines as a cost of doing business.[20]

Training Inspectors

Training programs sponsored by the Federal Government have increased the number of State inspectors trained in hazardous materials, but there are still great disparities among the sizes of State inspection forces. California has a large, well-trained force as part of CHP. In 1983, the hazardous materials inspection unit consisted of 93 civilian commercial vehicle inspectors, 132 traffic officers who operated 40 platform scales and 9 other inspection facilities, 67 traffic officers trained and equipped for mobile road inspections, and 130 civilian motor carrier specialists who performed off-highway and terminal inspections.[21] Few other States have such extensive systems. Vermont, for example, has only part-time inspectors, and some States have no inspection force at all.

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[17] J.W. Schmidt and D.L. Price of Virginia Polytechnic Institute, *Hazardous Materials Transportation in Virginia* (Richmond, VA: Virginia Department of Transportation Safety, 1980), p. XIII.

[18] U.S. Department of Transportation, Materials Transportation Bureau, *Annual Report on Hazardous Materials Transportation, Calendar Year 1983* (Washington, DC: U.S. Government Printing Office, 1983), p. 126.

[19] Captain Richard Landis, in U.S. Congress, Office of Technology Assessment, "Transcript of Proceedings—OTA Workshop on State and Local Activities in Transportation of Hazardous Materials," unpublished typescript, Washington, DC, May 30, 1985.

[20] U.S. Department of Transportation, *Annual Report*, op. cit., pp. 71-72.

Inspecting vehicles for compliance with Federal and State hazardous materials regulations requires specialized training, knowledge, skill, and experience. Most States do not have the resources for an independent training program and send inspectors to the Transportation Safety Institute (TSI), a multimodal training establishment supported by the Department of Transportation.

TSI offers instruction at its facility in Oklahoma City and at State-operated sites if requested; its courses are open to Federal, State, and local government employees and to private industry. Priority for enforcement courses has been given to trainees from States participating in SHMED.

In addition to courses on radioactive materials, TSI offers two inspection courses: one in hazardous materials compliance and enforcement and one in cargo tank compliance and enforcement. Both are organized into three phases: a self-study introduction that the student completes before attending class, a week of classroom instruction based on case studies, and a field exercise to be completed independently by the student once back on the job. In 1984, TSI trained more than 2,500 enforcement officers in courses offered at 29 locations.

A few States, notably California and Illinois, operate extensive training programs, staffed either with their own personnel or by instructors provided by TSI. CHP conducts a comprehensive State training program, during which uniformed CHP inspection officers attend a 20-week basic law enforcement training course on hazardous materials inspection procedures at the CHP Academy. Officers are then assigned to field commands where they receive 30 days of training from veteran CHP inspectors. In addition, officers receive periodic refresher training throughout the year at their field headquarters and return to the Academy every 3 years for in-service training. CHP officers assigned exclusively to commercial enforcement duties at inspection and scale facilities and on mobile units are selected from veteran inspection officers. They attend an 80-hour commercial enforcement class at the Academy, with retraining every 2 years. Civilian inspectors assigned to CHP inspection duties must have at least 1 year of experience in the maintenance of heavy-duty commercial vehicles. They attend the 80-hour enforcement class at the Academy and receive additional in-service training every 2 or 3 years. CHP also provides training for other State agency personnel involved in hazardous materials management and for employees of the regulated industries. Two-day hazardous materials seminars are conducted as needed for these groups.[22]

Private firms also offer hazardous materials training, and courses on inspection and enforcement are available from a wide variety of organizations. State officials indicate that the courses vary in content and suggest that the Federal Government or a national, professional group should develop a standardized curriculum and uniform training guidelines.

In recognition of the complexity of hazardous materials regulations, several States have set up programs to educate industry about compliance and enforcement procedures. Maryland, California, and Illinois work closely with the trucking industry through State and local industry associations to promote voluntary compliance. Enforcement officials in Maryland hold informational meetings regularly with industry groups and ensure that new regulations or procedures are covered by the press. CHP conducts training for industry personnel to acquaint them with inspection requirements. Illinois postponed implementation of its enforcement program for 2 years to allow industry time to assimilate the regulations and move toward voluntary compliance.

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[21] National Conference of State Legislators, *Hazardous Materials Transportation: A Legislator's Guide* (Denver, CO: 1984), p. 36.

[22] U.S. Department of Transportation, "SHMED Program Workshop Proceedings," op. cit., p. 126.

CASE STUDIES: STATE PROFILES

No two State enforcement programs are alike. Some are large and well-financed; others have smaller resources and are tightly focused. The following short profiles of the programs in Illinois, Washington, and Maryland highlight some of the interesting accomplishments of State programs.

Illinois

Before 1977, Illinois had no central regulatory agency responsible for hazardous materials transportation and no State enforcement program. Once a study identified these deficiencies, the legislature authorized the Illinois Department of Transportation (IDOT) to regulate the transportation of hazardous materials on the highways and gave the State Police enforcement power. In 1979, the Illinois legislature adopted regulations that included 49 CFR Parts 171, 172, 173, 177, and 178 and Part 379 of the Bureau of Motor Carrier Safety Regulations. The Illinois regulations differed from their Federal counterparts in some important respects: Illinois set a higher threshold of applicability, exempting from regulation all hazardous materials that, under Federal regulations, do not require placarding. It also excluded certain agricultural products shipped between farms. By narrowing applicability, Illinois targeted bulk shipments—deemed the most important safety problem—for enforcement efforts.

Training of State Police officers was a key component in the enforcement program. Initially, 32 officers were trained in basic hazardous materials inspection and cargo tank inspection at TSI in Oklahoma City. As the State program developed, IDOT set up its own 3-week basic training program, supplemented by regularly scheduled refresher courses. Both the basic training and refresher courses focus on the regulations, procedures for conducting inspections, and methods of preparing a case for prosecution. During training, case studies are presented to demonstrate successful and unsuccessful techniques. Training also emphasizes use of standard equipment issued by on-the-road inspectors for detection and recording of violations and for personal safety—items such as cameras; binoculars; vehicular-mounted detection and surveillance apparatus; explosive meters; and protective footgear, coveralls, and masks. IDOT attorneys and industry representatives participate in the training program to ensure that as many affected parties as possible are well informed.

In order to promote industry compliance, IDOT introduced the enforcement program slowly and deliberately. The first fines were levied 2½ years after regulations were adopted. This gave the regulated industries time to become familiar with the regulations and afforded inspectors a protracted training period. From 1979 to 1981, the Hazardous Materials Department of IDOT sent copies of the regulations with explanations to all State industries that were potential users or producers of hazardous materials. (The mailing list is kept current and used to inform industry of changes in regulations and enforcement.) The Department set up seminars and work sessions to discuss the regulations and procedures with such industry groups as the Illinois Trucking Association, the National Tank Truck Carriers, and the Tank Truck Manufacturers Association. In the meantime, State Police inspectors issued Notices of Apparent Violation to drivers and sent copies to the Hazardous Materials Department of IDOT. The Department notified the offending companies, explaining the regulations and apparent violation. After this period of education and training, the Department began sending frequent offenders letters warning that continued violations would mean fines up to $10,000. The letter explained the fine system and appeal process.

During the first 3 years of inspection, the number of violations found by inspectors remained at approximately 2,400 annually, but the mix of violations changed. Minor violations, such as mistakes in paperwork or a torn placard, decreased, while major violations rose. IDOT attributes the decline in minor violations to the educational program for industry conducted by the State. IDOT concludes that the rise in major violations found by inspectors was due to the in-service training the inspectors received and to the experience they gained on the job.[23]

In a 1983 study, IDOT performed a Critical Safety Analysis of truck survey data to quantify the effects of its accident prevention program. It found that the chief problem was private, intrastate hazardous materials carriers. The analysis showed that, while private carriers accounted for one-third of the mileage traveled by all common carriers, they were involved in three-quarters of the hazardous materials accidents recorded throughout the State.[24]

Washington

Washington's enforcement program exemplifies a State program that has been improved by a management information system. Officials of the Washington Utilities and Transportation Commission report that the most useful component of this system is the Critical Safety Management Breakdown Analysis. It utilizes two existing databases, the Computerized Accident System and the Carrier Profile System, to track carriers frequently involved in accidents or found to be in violation of regulations.

The Computerized Accident System includes all truck accident reports filed by enforcement agencies in the State. Hazardous materials involvement is noted on the field report, which is analyzed before it is entered into the computerized information system. Analysts make followup calls to carriers when the validity of the field report seems questionable. The followup checks have helped provide an accurate count of accidents involving hazardous materials. Based on their experience with the Computerized Accident System since 1975, State officials conclude that investigating officers do not always have sufficient training to evaluate accurately a situation that may involve hazardous materials. While investigators generally recognize blatant violations, they frequently miss less obvious incidents or make mistaken identifications. Between January and June 1983, statistical analysis identified 38 accidents involving hazardous materials, of which only 14 were recognized as such by the investigating officers. The remainder were identified through followup investigations. Washington State officials suspect that many hazardous materials spills are never reported, particularly those in which quantities are below placarding requirements. They suggest that obtaining an accurate picture of hazardous materials incidents requires careful analysis and followup of accident data from field reports.

The second database, the Carrier Profile System, is a computerized record of all violations, assembled by carrier. The system records the violation by date, time, and location and describes the action taken by State enforcement agencies. The database includes both hazardous materials violations and other forms of motor carrier safety violations.

The Critical Safety Management Breakdown Analysis integrates the two databases and identifies and keeps records on hazardous materials carriers that have frequent accidents or violations. State officials report that the system provides the quantifiable data necessary to evaluate the effectiveness of the hazardous materials enforcement and prevention programs.

Maryland

Maryland's hazardous materials enforcement program began in the early 1970s with a survey of the transportation of radioactive materials. The State expanded the program to cover all classes of hazardous materials in 1981. Inspections are conducted by specially trained State Police officers posted at points throughout the State, including several on Interstate routes. Inspections are performed daily on a random basis.

Maryland has developed a well-trained inspection force. The State has fully utilized TSI's outreach activities, sponsoring three courses with about 50 students enrolled in each. The first group of officers to be trained was drawn from select units of the State Police Truck Enforcement Division that patrols major interstate highways. After the officers had completed the course conducted by TSI on-site in Maryland and were ready for field work, they received 2 months of on-the-job training under the supervision of Federal hazardous materials inspectors from BMCS and OHMT. During this time, roadside inspections were performed, but only warnings, not citations, were issued. State officials used this grace period to contact the Maryland Motor Truck Association and major independent truckers to inform them of Maryland's hazardous materials regulations and enforcement program and to solicit voluntary compliance. Maryland officials feel the grace period enabled novice inspectors to gain experience and allowed hazardous materials carriers time to adjust to the new regulatory requirements.

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[23] Ibid., p. 126.
[24] Ibid., p. 204.

As a matter of policy, Maryland regularly informs the trucking industry about regulations and enforcement practices. The State Police have developed a training program for commercial carriers, and officers hold frequent meetings with industry groups. Whenever an inspector cites a truck for a violation, the State Police department sends a copy of the traffic safety report to the Maryland Truck Association for forwarding to the truck company. In this way, the company is notified of the violation in time to take whatever corrective action may be needed on other trucks in their fleet.

Even though the number of violations has not declined appreciably, Maryland officials believe the enforcement program has been effective. During the second quarter of 1984, the State Police made 1,106 roadside inspections and issued 88 citations and 263 warnings. Officials note that the incidence of detected violations, about one for every three vehicles inspected, has remained essentially constant since enforcement began in 1982. They attribute the lack of decline, despite vigorous enforcement, to several factors. First, the inspection officers are increasingly skilled and sophisticated in their ability to detect violations. Second, fines assessed by the Maryland courts are low, and enforcement officials believe they have a minimal preventive value. Third, much of the hazardous materials traffic on Maryland highways is passing through and thus not easily influenced by State enforcement activities.[25]

STATE AND LOCAL ACCIDENT PREVENTION ACTIVITIES

While State agencies undertake most enforcement and inspection tasks for hazardous materials, local government agencies are concerned primarily with emergency response and public safety in the event of transportation accidents and spills. Both State and local governments have authority over accident prevention measures and protection of public safety, including: restriction of the routes that hazardous materials shippers may use or hours when shipments are permitted; requirements for licensing, registration, or permits; advance notification or other special procedures; and escorts for hazardous materials movements. Because compliance with these requirements involves expenditures of time and money by industry, considerable controversy often arises when such requirements are imposed.

Two factors limit the nature and extent of State and local government involvement in hazardous materials accident prevention. First is a general lack of the expertise and resources, especially among local agencies, necessary to carry out effective inspection and enforcement. Second, the Federal Government is authorized to preempt certain State and local laws and ordinances. While these factors tend to narrow the available range of State and local actions, they do not preclude the enactment of a variety of requirements. The following discussion presents an overview of Federal preemption powers for hazardous materials transportation and the types of requirements that have been instituted by State and local jurisdictions.

Preemption

Section 112 (a) of the Hazardous Materials Transportation Act (HMTA) states that, "any requirement of a state or political subdivision thereof, which is inconsistent with any requirement set forth in this title, or in a regulation issued under this title, is preempted."[26] DOT has established procedures allowing States, localities, affected parties, and DOT itself to seek administrative rulings as to whether a State or local requirement is inconsistent.[27] DOT's administrative process is meant to serve as an alternative to litigation; however, the process is only advisory in nature and does not preclude judicial interpretations of a State or local requirement. Independent of DOT procedures, a Federal court may be asked to decide whether a State or local requirement is inconsistent and therefore preempted under the HMTA or invalid under the Commerce Clause of the U.S. Constitution.

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[25] Maryland Department of Mental Health and Hygiene, *SHMED Quarterly Report, April-June 1984*, unpublished report filed with U.S. Department of Transportation, 1984.

[26] 49 U.S.C. 1811 (a).

[27] 49 CFR 107.203 to 107.211.

HMTA also allows DOT to waive preemption of inconsistent State or local requirements where they afford equal or greater levels of protection to the public than do the Federal requirements and do not unreasonably burden commerce.[28] Procedures regarding the submission and review of waiver applications have also been promulgated.[29]

Sixteen inconsistency rulings have been issued by DOT.[30] Generally, the types of requirements found to be inconsistent are those pertaining to areas already subject to Federal regulation, such as definitions of hazardous materials, vehicle placarding, packaging or container requirements, insurance requirements, and shipping papers. Consistent requirements are those falling within the scope of local traffic regulations, such as separation distances between vehicles, use of headlights, vehicle inspections at loading/unloading areas, and requirements for immediate notification of accidents.

Licensing, Registration, and Permits

Licensing, registration, and permit requirements vary widely at the State and local level, causing difficulties for enforcement officers and industry. For example, 26 States require that transport companies carrying hazardous wastes register with the State and pay a fee. Fees imposed range from $25 up to $500 and may be good for only one trip or for as long as a year. Four States require special training or certification for drivers of hazardous waste vehicles. (See table 2-3 for a summary of varying State requirements.)

In other States, an ordinary driver's license is all that is required for drivers of any truck. In addition, local jurisdictions may require hazardous materials carriers operating within their boundaries to purchase separate permits or registrations. Some communities use this income to finance emergency response activities; others treat it as general revenue.

These State and local requirements typically apply to trucks. Many trucking company officials believe that continued adoption of special requirements by different States impedes interstate commerce and have taken legal action. For example, a 1983 New Hampshire law imposing license fee requirements on vehicles transporting hazardous materials was challenged in court by State and national representatives of the trucking industry. Although the district court found that the law violated the Commerce Clause and was preempted by the Hazardous Materials Transportation Act, the law was upheld when the decision was reversed on appeal.[31] Proliferation of State requirements can pose hardships for interstate carriers. One transporter noted that, in order to ensure that his driver was completely prepared to transport a load of hazardous waste from Georgia to Wisconsin, he had to telephone every State along the route, sometimes calling as many as four or five agencies within a State, before he was fully apprised of all the requirements.[32]

DOT has issued a number of inconsistency rulings regarding State and local permit requirements. Even though there are no explicit Federal permit or registration requirements, DOT found the requirements to be inconsistent with HMTA as they caused delays, resulted in diversions of shipments, or required transporters to provide information that differed from Federal shipping paper requirements.[33] With respect to fees, DOT decided in one case that a Vermont requirement that imposed a $1,000 fee per shipment of certain radioactive materials was inconsistent because it was applied in a discriminatory manner (e.g., only to certain radioactive materials), diverted shipments into other jurisdictions, and

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[28] Section 112(b) of the Hazardous Materials Transportation Act (HMTA), 49 USC 1811(b). The Senate Committee Report (No. 93-1192, 93d Cong., 2d sess., Sept. 30, 1974) that accompanied the Senate HMTA bill indicated that this provision should be used in certain exceptional circumstances necessitating immediate action at the State or local level.

[29] 49 CFR 107.215 to 107.225.

[30] See 43 F.R. 16954; 44 F.R. 75565; 45 F.R. 71881; 46 F.R. 18917; 47 F.R. 18457; 47 F.R. 1231; 47 F.R. 51991; 48 F.R. 760; 49 F.R. 46632; and 50 F.R. 20871.

[31] *New Hampshire Motor Transport Association, et al. v. Flynn, et al.*, Opinion of the U.S. Court of Appeals for the First Circuit, Dec. 26, 1984.

[32] Reported at the May 1985 OTA workshop.

[33] See, for example, Inconsistency Rulings 8, 10, 11, 12, 13, 14, and 15, 49 F.R. 46637-46667, Nov. 27, 1984.

Table 2-3.—States With Proposed or Existing Hazardous Wastes Transportation Fee or Registration Requirements, 1985

State	Requirements							
	Company registration	Company fee	Years covered	Vehicle registration	Vehicle fee	Vehicle inspection	Driver training/ certification/ registration	Industry spill equipment and bonds required
Alabama	Yes	None	3 yrs					
Arizona	No							
Arkansas	Yes		5 yrs					
(Department of Pollution)		$100						
(Arkansas Transportation Commission)		$50						
California	Yes	$50				First 10 at $50 each/ exempt ...	24 hrs[a] certified by State	
Colorado	No							
Connecticut	Yes	$350		Each vehicle		Inspect and certify	Certification required	Yes
Delaware	Yes	No		Authorizing letter				
Florida	No							
Georgia		$25 trip permit[a b]						
Idaho	Yes	$25 trip permit						
Illinois	Yes	No		Trailers only				
Indiana	Yes[c]	$100[d]		$10 each				
Iowa	No							
Kansas	Yes	$250 annually						
Kentucky	Yes	$250[e] annually						
Louisiana	Yes, company must be registered with Federal EPA	No						
Maine	Yes	$100		Yes	$50 each		Yes $50	
Maryland	Yes	No		Yes	$50 each		Yes $20	$50,000 surety bond
Massachusetts	Yes[f]	$100		Yes	$200 each			$10,000 surety bond
Michigan	Yes[g]	$500		Yes	$200 each			
Minnesota	Yes	No						
Mississippi	No							
Missouri	Yes				$20 per vehicle			

Table 2-3.—States With Proposed or Existing Hazardous Wastes Transportation Fee or Registration Requirements, 1985 (Continued)

State	Requirements							
	Company registration	Company fee	Years covered	Vehicle registration	Vehicle fee	Vehicle inspection	Driver training/ certification/ registration	Industry spill equipment and bonds required
Montana	No							
Nebraska	No							
Nevada	No							
New Hampshire				Yes[h]	$50			
New Jersey				Yes	$50[i]			
New Mexico	No							
New York		$5,000[j]						
North Carolina	No							
North Dakota	Yes	No						
Ohio	Yes	$25			$3 each			
Oklahoma	Yes	No						
Oregon	Yes	No						
Pennsylvania	Yes	$200 annually						Yes $60,000 collateral bond or letter of credit
Rhode Island	Yes	No		Yes	$25	Yes		
South Carolina	Yes	No						
South Dakota	No							
Tennessee	Yes	$285 annually						
Texas	Yes	$25						
Utah	No							
Vermont	Yes	No		Yes/ tractor and trailer	$10 each			
Virginia	Yes	No	10 yrs					
Washington	No							
West Virginia	No							
Wisconsin	Yes[k]	No						
Wyoming	No							
District of Columbia	No							

[a] For PCBs only.
[b] State requires notification before entering or leaving State.
[c] For liquid industrial waste only.
[d] Includes registration of one vehicle.
[e] Hazardous materials.
[f] File monthly report on hazardous waste movement.
[g] The words "Hazardous Waste Hauling Vehicle," company name, city and State, and seal indicating month and year of license expiration shall be on waste-hauling vehicle.
[h] Annual report required.
[i] $50 for first 20 vehicles, $5 each there after.
[j] $5,000 to purchase exempt letter.
[k] Requires names and EPA number of disposal sites.

SOURCE: American Trucking Association survey provided by Charles Mayer, Tri-State Motor Transit Co.

the response team funded by the fee requirement replicated Federal emergency response programs.[34]

The trucking industry has made Congress aware of its concerns, and BMCS has begun, at congressional request, a 5-year program that will lead to greater uniformity in some areas. BMCS is surveying State motor carrier laws to determine those that are more or less stringent than Federal requirements in the areas of driver qualifications and training, hours of service, and equipment maintenance. When completed, the survey will be reviewed by a panel convened by the Secretary of Transportation, and if warranted, DOT will consider rulemaking to preempt State laws that do not ensure greater safety than their Federal counterparts.

However, many State and local enforcement officers as well as industry representatives feel strongly that national, uniform standards should be established in areas related to hazardous materials as well. Carrier associations and insurance industry representatives have voiced strong support for a national hazardous materials driver's license requiring special training.

In addition, this Federal review will leave untouched problems of varying State and local special permits and registration fees. The transport industry views these requirements primarily as State and local funding devices for enforcement or emergency response activities. Carriers find them annoyingly inconsistent and financially burdensome. Preemption by the Federal Government may not be the only appropriate way to achieve uniformity of requirements—a goal that many see as the most important need in hazardous materials regulation. National guidelines for permits and registrations could provide uniformity, and consensus building would ensure at least some measure of agreement between concerned public and private sector groups.

Notification

Notification requirements are used by State and local governments, and by transportation facilities (e.g., bridge and tunnel authorities) to obtain information on shipments of hazardous materials into or through their jurisdictions. The data are used for inventory purposes, to arrange escorts, for emergency response planning, and in support of enforcement activities. Figure 2-3 indicates which States have enacted notification laws and the types of hazardous materials covered.

Knowing which hazardous materials are present or pass through a community is important to many State and local agencies. However, the use of notification provisions may not be the most efficient or effective method of data collection available (chapter 4 discusses data collection in more detail). Recent studies conducted for DOT indicate that notification requirements targeted at a limited number of extremely hazardous substances (e.g., high-level nuclear waste) have provided useful information. However, most local governments do not have the resources or the expertise to implement and enforce requirements that encompass a broader range of hazardous materials.[35] In addition, transporters are concerned that a multiplicity of State and local notification regulations would create scheduling difficulties and substantial increases in paperwork.

At the Federal level, the U.S. Coast Guard and NRC have established notification requirements. The Coast Guard requires all vessels carrying certain dangerous cargo to notify appropriate port authorities up to 24 hours in advance before entering or leaving U.S. ports and waterways.[36] Dangerous cargo includes Class A explosives, oxidizing materials or blasting agents, large quantities of radioactive material or certain fissile radioactive material, and bulk shipments of other specified materials.[37] The NRC regulation requires licensees to notify States in advance regarding shipments of certain radioactive materials.[38] Recognizing the difficulties faced by carriers confronted with varying State notification rules, DOT has taken the position that this is an area warranting uniform national requirements. DOT has not issued Federal guidelines. It has, however, preempted a number of non-Federal requirements, either because they differed from the NRC

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[34] Department of Transportation Inconsistency Ruling 15, 49 F.R. 46660, Nov. 27, 1984.

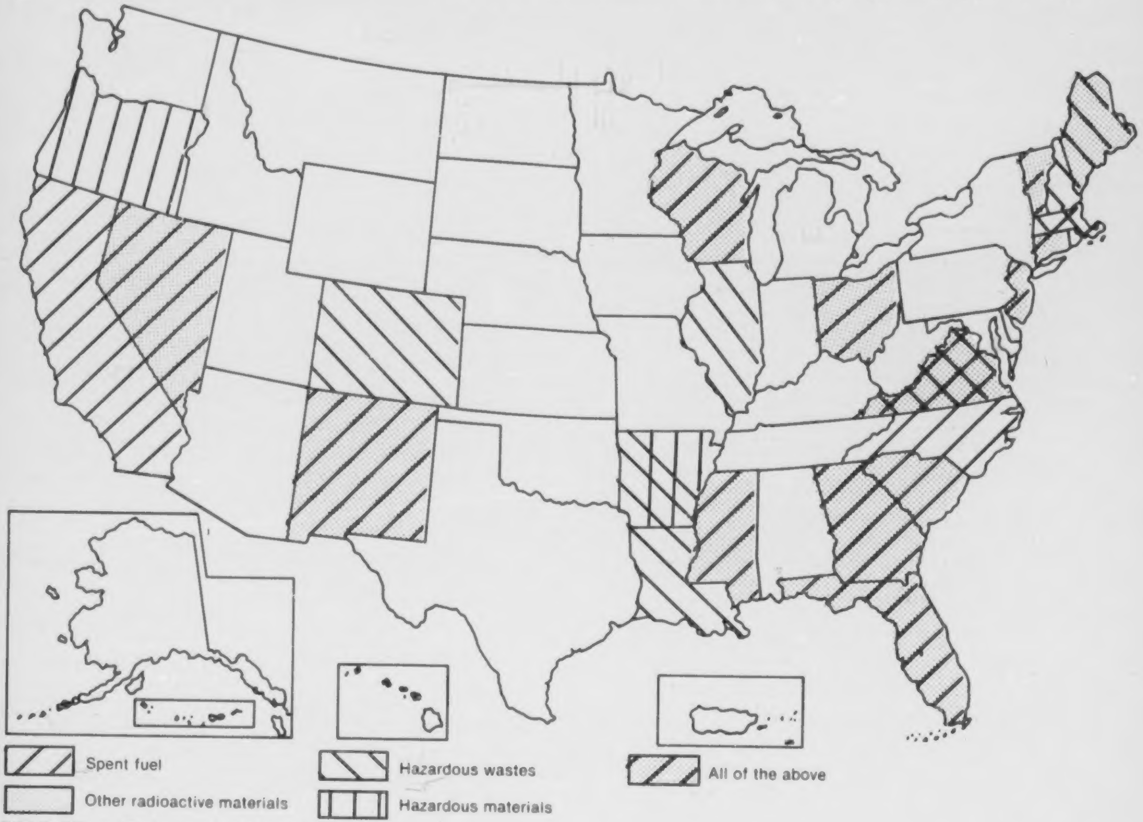
[35] See Battelle Memorial Research Laboratories, Battelle Human Affairs Research Center, *Assessment of State and Local Notification Requirements for Transportation of Radioactive and Other Hazardous Materials* (Columbus, OH: Jan. 11, 1985).

[36] 33 CFR 160.211 and 160.213. Additional requirements for vessels on voyages of 24 hours or more and vessels bound for the Great Lakes are specified in 33 CFR 160.20 and 160.209.

[37] 33 CFR 160.203 and 46 CFR 153 (table).

[38] 10 CFR 71.97.

Figure 2-3.—States With Hazardous Materials Notification Requirements by Type of Material, 1985



SOURCE: Office of Technology Assessment.

regulation or had the potential to cause transportation delays or traffic diversions.[39]

Routing

Routing is an important tool for local governments to use in preventing or reducing the consequences of hazardous materials accidents, and increasing numbers of cities, counties, and townships are adopting ordinances requiring hazardous materials carriers to use designated routes. Careful routing decisions mean that hazardous materials shipments are restricted to the safest routes, often interstate highways and beltways, thus reducing the overall risk of an accident as well as risks on local streets and highways. In addition, routing is a low-cost prevention measure that local police can enforce without additional equipment or training. On the other hand, routing requirements may lengthen and complicate trips for truckers, and sometimes bring local governments into conflict with each other or with Federal regulations protecting interstate commerce.

The only Federal requirement pertaining to routing of nonradioactive hazardous materials is general:[40]

> Unless there is no practicable alternative, a motor vehicle which contains hazardous materials must be operated over routes which do not go through or near heavily populated areas, places where crowds are assembled, tunnels, narrow streets, or alleys.

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[39] See for example IR-16, 50 F.R. 20871, May 20, 1985. DOT has adopted the NRC notification requirements.

[40] 49 CFR 397.9(a).

This provision is contained in the Federal Motor Carrier Safety Regulations. DOT has published guidelines to assist communities in designating routes for transporting hazardous materials.[41] The guidelines include procedures for analyzing risks associated with the transportation of hazardous materials on alternative routes within a jurisdiction, and emphasize the importance of involving a broad spectrum of community and industry members in the decisionmaking process. (A 1983 demonstration program in Portland, Oregon, described on pp. 34-35, successfully tested the guidelines.)

A number of localities, including Columbus, Denver, and Boston, have established routing restrictions based on the Federal Motor Carrier Safety provision.[42] The types of regulations enacted by these jurisdictions include restricting the use of certain roads, prohibiting transportation and delivery during rush hours, and specifying operating requirements. However, reaching a regional consensus is frequently difficult, even when a broad spectrum of the community is consulted. Often, for example, after a community routing risk assessment has been completed, hazardous materials carriers are diverted from central city routes onto surrounding roadways—usually Interstate highways—that traverse less populated areas. However, since many suburban communities do not have the specialized hazardous materials response teams of their urban neighbors, they feel particularly vulnerable to increased hazardous materials traffic and resist agreeing to such routing requirements. In 1985, in the Cincinnati region, suburban townships opposed the city's attempts to divert through shipments from city roads onto outlying highways.

The trucking industry has also opposed some local routing ordinances, claiming that they interfere with interstate commerce and are inconsistent with HMTA. Boston's regulations restricting the use of city streets for hazardous materials transportation were challenged by the American Trucking Associations, both in Federal court and through DOT's inconsistency ruling process.[43] After a lengthy administrative review process, DOT decided that it could not reach a conclusion, because even though the routing restrictions enhanced public safety, consultation with affected jurisdictions had been limited as the requirements were developed.[44] A final decision by the court had not been reached by late 1985.[45]

Highway routing of radioactive materials is addressed specifically in a 1981 DOT rulemaking, docket HM-164.[46] The DOT regulations were established in response to severe restrictions that had been placed on the transportation of radioactive materials by local jurisdictions, most notably New York City, making some through shipments impossible. HM-164 requires carriers to follow "preferred routes" (routes designated by States or Interstate highways where State alternates have not been named), prepare and file route plans, provide specialized training related to radioactive materials and emergency response, and comply with appropriate NRC security requirements. DOT has also developed guidelines for route selection for shipments of radioactive materials.[47]

FINDINGS

Continued support is needed for State multimodal hazardous materials enforcement activities. The SHMED program, which ends in 1986, has had a significant influence in shaping State enforcement programs despite relatively low funding levels. Although MCSAP will continue to fund State enforce-

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[41] E.J. Barber and L.K. Hildebrand, et al., *Guidelines for Applying Criteria to Designate Routes for Transporting Hazardous Materials—Implementation Package*, FHWA-1-80-20 (Washington, DC: U.S. Department of Transportation, 1980).

[42] See for example, *Columbus Codes*, 1959, chapter 2551; article IV of chapter 22 of the *Denver Municipal Code*; and 46 F.R. 18921, Mar. 26, 1981, for a description of Boston's regulations.

[43] See 46 F.R. 18918, Mar. 26, 1981.

[44] F.R. 18457, Apr. 29, 1982. DOT also cited some concern about the validity of the data used for Boston's risk determination but concluded that further refinement of the data would not have had a substantial effect on the outcome.

[45] 12 Environmental Law Reporter 20,789 (D. Mass. 1981).

[46] 46 F.R. 5298, Jan. 19, 1981.

[47] U.S. Department of Transportation, Research and Special Programs Administration, Materials Transportation Bureau, *Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials*, DOT/RSPA/MTB-84/22 (Washington, DC: U.S. Government Printing Office, June 1984 (originally published in June 1981)).

The Portland Demonstration Project

In 1983, DOT contracted with Portland, Oregon, to demonstrate and test the newly promulgated Federal policy on highway routing of hazardous materials shipments and, in particular, the FHWA guidelines. The demonstration, conducted by the Portland Office of Emergency Management (POEM) in cooperation with the six surrounding counties, was the first attempt by jurisdictions in the Portland region (and one of the first anywhere in the country) to carry out a systematic analysis and comparison of alternative routes for hazardous materials movements.[48]

Two assumptions underlay the demonstration. The first was that hazardous materials transportation is regional in nature and that routing decisions must be made with the safety of the entire region in mind. The second was that there would be at least one acceptable route that would permit shipment of hazardous commodities in conformance with Federal safety regulations. Following procedures set forth in FHWA guidelines, the study was conducted in four steps.

The first step was formation of a technical advisory committee consisting of officials from local fire departments and emergency service agencies in the city and six surrounding counties, representatives of trucking associations and local industry, and Federal and State officials. The committee also included individuals with special technical expertise, such as traffic engineers, enforcement officers, and truck terminal dispatchers. The committee helped in drawing up the project work plan, locating sources of information, and identifying and analyzing routes.

The second step focused on locating hazardous materials terminals and their access routes and identifying the types of hazardous materials frequently transported. With the cooperation of the local fire departments, the major terminals shipping or receiving hazardous materials were surveyed to identify the types of hazardous materials handled and the access routes most commonly used. Data were collected by means of questionnaires followed up by phones calls. The survey results indicated that most truckers and dispatchers took safety into account in selecting routes and that, in many cases, their selections were consistent with later study findings as to the safest routes.

Information on through shipments was gathered by sampling shipping papers at three weigh stations on Interstate highways. Flammable liquids were found to make up the majority of shipments, representing 55 percent of all hazardous materials shipped. It was also found that the types of hazardous materials shipped through the region were different from those shipped within the region, with through shipments including a higher proportion of corrosives, explosives, poisons, and oxidizers. This information was important in evaluating the risks involved in shifting through shipments onto a newly opened freeway running through the Portland suburbs. Because the survey provided information on facilities and commodity flow that was not previously available in the Portland region, it also proved to be valuable to fire departments and hazardous materials response teams in developing emergency response plans.

The third step involved identifying alternative routes. For this purpose, hazardous materials shipments were classified into three kinds of trips: local deliveries, shipments to industrial areas, and through shipments. Since all major routes within the metropolitan area were used for local deliveries (such as deliveries to gas stations), the POEM staff and the advisory committee concluded that routes for local trips could not be restricted and eliminated them from further study. They also agreed that not all classes of hazardous materials warranted routing restriction, and limited the list to certain high-risk commodities: explosives, poisons, flammable solids, and hazardous materials shipped in bulk tankers.

In the fourth step, 10 sets of alternate routes were compared to determine which were the safest. The routes were divided into segments, and each segment was evaluated according to the following criteria:

- accident rates and probabilities;
- population exposure, in terms of the number of people living immediately adjacent to a route and those living within one-quarter mile on either side;
- population risk, expressed as the product of accident probability and population exposure;
- emergency response availability, measured in terms of response time, accessibility, and availability of water or other extinguishing agents; and
- roadway characteristics, such as lane and shoulder widths, lane changes required to stay on route, and tunnels and railroad crossings to be traversed.

Although most of the criteria were quantifiable, many decisions required the professional judgment of the staff and the advisory committee. Consensus on the safest route was reached in all but one case, a reroute around a tunnel. The final decision in that case was made by the fire marshal of the emergency response jurisdiction, subject to acceptance by other fire departments along the alternate route. In general, the alternate route analysis indicated that interstate freeways were preferable because they had the lowest accident rates and probabilities of all the routes considered.

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[48] City of Portland, Oregon, Office of Emergency Management, *Hazardous Materials Highway Routing Study* (Washington, DC: U.S. Department of Transportation, 1984), p. 1.

As a result of the demonstration, the Portland City Council, in cooperation with the State Highway Department and Oregon Transportation Commission, enacted ordinances banning hazardous materials shipments from one tunnel and two grade-level rail crossings. The tunnel had been used frequently by trucks carrying petroleum products from the principal distribution center in the Portland area to the northwestern parts of the State, and fire officials determined that the tunnel posed an unacceptably high risk. To compensate for any additional risks posed by the rerouting decisions, the City of Portland and three adjoining counties revised their mutual-aid agreements to assure that the affected counties would have access to the city's specialized fire-fighting equipment. POEM officials notified local industries, shippers, and carriers about the restrictions and the recommended alternate routes. It is expected that most truckers will comply; additional liability will accompany an accident off the recommended routes.

ment programs, States are concerned that priority will be given to general motor carrier safety programs and that hazardous materials enforcement—especially for nonhighway modes—will be slighted.

Penalties for regulatory violations, including failure to report hazardous materials incidents, should be consistent across governmental and jurisdictional levels and sufficiently large to discourage future infractions. An effective enforcement program requires that legislatures, enforcement agencies, and courts be aware of the death, injury, property damage, and environmental harm that could result from accidental release of hazardous materials and set penalties accordingly.

State and local enforcement personnel need additional training and current information on hazardous materials regulations for all modes of transportation. Methods used by the Federal Government to deliver this information to State and local officials need to be improved and strengthened. Programs to educate shippers and carriers on safety measures and regulatory compliance need strengthening as well.

National standards establishing uniform State hazardous materials requirements and regulations would simplify and improve compliance by shippers and carriers, and State and local enforcement activities. State, regional, and local agency concerns as well as those of industry should be considered in formulating standards. The areas where uniformity is most needed are:

- **Licensing** to ensure that drivers and others handling hazardous materials are qualified and have been properly trained. Some form of national truck driver's license is favored by many State, local, and industry officials.
- **Permit or registration requirements** to obtain information and collect fees in a coordinated manner that does not unduly burden transporters.
- **Shipment notification systems** that provide useful information for localities without unduly burdening carriers.

Development of local routing restrictions should be based on interjurisdictional consultation and the use of explicit safety criteria. Although it is likely that the development of a routing scheme that enhances overall safety will be a difficult process for some regions, the Portland experience demonstrates that it is possible. In those instances where hazardous materials shipments are routed around cities through suburban communities, it may be necessary to establish a regional emergency response system.

Chapter 3

Emergency Response and Training

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Emergency Response and Training

State and local governments must be able to respond effectively to hazardous materials transportation emergencies as part of their obligation to protect the health and safety of the public. Local police officers are usually first at the scene of an accident and have primary responsibility for public safety. Their skill in handling the accident determines in part the impact that accident will have on those in the immediate vicinity and on the community at large.

Two responses to hazardous materials transportation accidents occurring 3 years apart illustrate the range of problems associated with hazardous materials emergency response activities and the improvements developed with time and experience in response procedures.

On October 15, 1982, an accident in Odessa, Delaware, between a pickup truck and a tank truck resulted in a rollover of the tank truck and the release of about 150 gallons of the product from the tank truck's dome cover. The tank truck contained divinyl benzene (DVB), a moderately toxic material when inhaled, and carried a "combustible" placard.

Arriving police officers reviewed the shipping papers, moving freely about the accident site. Approximately 100 emergency response personnel eventually responded to the accident; only some had previous experience or training in handling a hazardous materials transportation accident.

Photo credit: Research and Special Programs Administration, DOT

Unprotected emergency response personnel in action—a dangerous situation.

One hour after the crash, 48 emergency response personnel, complaining of respiratory and skin problems, were taken to the hospital, as was the tank truck driver who was still carrying the shipping manifest and bill of lading.

Emergency responders who remembered the name of the product consulted the U.S. Department of Transportation (DOT) *Hazardous Materials Emergency Response Guidebook* to identify the material. DVB is not listed by name in the guidebook, so they followed the instructions for divinyl ether, the only "divinyl" entry.[1] Although trained safety personnel from the tank truck company involved in the accident had arrived to clean up, they were not allowed to participate for almost 12 hours.[2] Problems associated with this hazardous materials accident included lack of coordination among responding organizations, inadequate information provided to hospital personnel treating emergency responders, failure to establish and maintain control over the accident site, and the participation of untrained individuals in response activities.

In contrast, on August 12, 1985, a tank truck carrying hazardous waste from the Norfolk, Virginia, Naval shipyard to New Jersey began to leak and stopped on the Capital Beltway in Northern Virginia during the evening rush hour. The waste consisted of hydrazine, thiourea, ethylene diamine, ethylene diamine tetraacetic acid, ammonium hydroxide, and sulfate compounds, which had been used to clean ships and submarines at the shipyard.

The Fairfax County, Virginia, Fire Department Hazardous Materials Team was on the scene within 10 minutes of notification. Concerned that the contents of the truck would corrode the container and cause it to burst, team members attempted unsuccessfully to stem the leak and then requested another vehicle to off-load the truck. Authorities, recognizing the danger posed by corrosive fumes, ordered the evacuation of residents in the area just south of the accident scene. Railroad tracks near the site were shut down, and traffic in the area was rerouted around the scene of the accident. No one was injured, although hundreds were inconvenienced for several hours.

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[1] C.H. Batten, Investigator, National Transportation Safety Board Accident Investigation Report, Oct. 15, 1982; and National Transportation Safety Board Safety Recommendations, I-83-1 and I-83-2, issued Nov. 29, 1983.

[2] Gene Meehnan, Safety Director, Matlack Co., personal communication to OTA staff, May 28, 1985.

Cleanup of the contaminated site involved digging up and disposing of 18 inches of asphalt and soil and an estimated 21 tons of sand spread to restrict the flow of spilled material. Some of the cleanup costs reportedly will be paid by the shipping company.[3] [4] Fairfax County costs for overtime pay for personnel from 10 county agencies and use of a helicopter may reach $100,000.

The contrast between the responses to the two incidents is marked, and demonstrates the difference coordination, cooperation, and training can make in ensuring an appropriate response. The Fairfax County hazardous materials incident involved the coordinated efforts of 10 county agencies to successfully handle a potentially dangerous incident. By comparison, the dangers inherent in the Odessa DVB spill were increased by the varying levels of training and coordination of the emergency response personnel, and much greater risks were posed to participating emergency service personnel and neighboring communities.

Without appropriate organization, training, and equipment for emergency response personnel, the public is at greater risk than necessary as hazardous materials move around the country.

This chapter explores emergency response from a State and local perspective. A literature review, findings of an OTA workshop with State and local officials, supplementary interviews, and surveys recently commissioned by the Federal Government and professional associations provide the basis for the information. Four topics are addressed:

- the institutional and legal framework for emergency response;
- training requirements and programs;
- planning for emergency response, including identification of problems and organization of resources; and
- equipment.

INSTITUTIONAL FRAMEWORK

Federal Responsibilities

Federal assistance for State and local emergency response activities for hazardous materials accidents is provided by many different Federal agencies.

The Federal Emergency Management Agency (FEMA) is the lead agency for the development and coordination of Federal emergency response plans to support State and local emergency response activities and to provide appropriate training. In this role, FEMA provides planning support and guidance prior to hazardous materials accidents and coordinates Federal response after the fact.

The U.S. Environmental Protection Agency (EPA) and the U.S. Coast Guard share responsibility for providing technical information and advice to first responders and State and local governments. If State and local governments cannot handle a severe accident or request Federal intervention, EPA and the Coast Guard will assume control and direct Federal emergency response activities. The Coast Guard operates the National Response Center for DOT as the point of contact for transportation accidents involving hazardous materials. In addition, the Coast Guard operates and maintains strike forces on the Atlantic, Pacific, and Gulf coasts for emergency response activities.

In the case of radiological accidents, Federal responsibility is shared by FEMA, the Nuclear Regulatory Commission, and the U.S. Department of Energy. NRC and DOE maintain authority for planning and program development for emergency response, notification, technical assistance and advice, and involvement in response activities for radiological spills. In addition, DOE maintains 30 regional emergency response teams for radiological incidents.

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[3] Mary Jordon and Martin Weil, "Chemical Spill Snarls Beltway," *Washington Post*, Aug. 13, 1985.

[4] *Chemical & Engineering News*, "Rash of Chemical Spills Occurs on Single Day," vol. 63, No. 33, Aug. 19, 1985, p. 6.

All of these Federal agencies conduct emergency response training, although the subject matter may differ. FEMA provides training in emergency response procedures at regional centers and at the national center, the National Fire Academy in Emmitsburg, Maryland. Training covers basic and advanced hazardous materials management classes.

EPA training is offered at two regional sites, Edison, New Jersey, and Cincinnati, Ohio, as well as nationally. Training covers response operations, equipment, and response decisionmaking. The U.S. Coast Guard offers training in basic hazardous materials emergency response to its employees and State, local, and industry participants at Yorktown, Virginia.

NRC training, offered at the Technical Training Center in Chattánooga, Tennessee, focuses on inspection and enforcement rather than on emergency response. Training previously conducted by DOE for Federal contractors and employees has been expanded to allow commercial carriers; enforcement agencies; and State, county, and local police and fire officers to participate. Courses cover basic emergency response and compliance with transportation regulations.

Federal emergency response activities are intended as supplements to, not as substitutes for, State and local emergency response to hazardous materials transportation accidents. Federal agencies generally offer technical advice and information, rather than physical assistance. However, active Federal participation is likely if radioactive hazardous materials, particularly spent fuel, is involved in a transportation incident.

Table 3-1 identifies the different Federal agencies that regulate hazardous materials transportation and their jurisdictional authority. This diversified Federal authority is a major reason that developing effective, coordinated Federal emergency response capabilities has proven difficult.

State and Local Authority

State authority for hazardous materials transportation and emergency response is equally fragmented and may rest with a State Fire Marshal's office or State departments of health, transportation, environment, radiological affairs, or civil defense—or more likely a combination of some or all of these. A State-by-State listing of the agencies responsible for hazardous materials regulation, enforcement, and emergency response is provided in appendix A.

Just as the statutory authority for emergency response varies from State to State, so does the interest emergency response generates within the State government. States that are highly industrialized, heavily traveled, confronted with exceptional hazards (such as a large number of waste disposal or nuclear facilities, or a heavy concentration of chemical industries), or have experienced a serious hazardous materials incident are more likely to support and encourage the development of emergency response planning and training and attempt statewide coordination. Believing that State assistance may be the best or even the only way of protecting rural areas in hazardous materials accidents, some States, including North Dakota, Delaware, Indiana, and Oregon, are developing statewide emergency response plans.

Tennessee has undertaken a unique program to improve its statewide emergency response capability. The Tennessee Emergency Management Agency (TEMA), in an effort to assure rural areas of adequate hazardous materials emergency response, divided the State into six districts, each with a district coordinator and equipped with a special response van. The district coordinators are trained by the TEMA training institute and must be recertified for hazardous materials response every 2 years. Their multiple responsibilities include training responders in their districts. As a result, Tennessee has more than 2,000 State-certified hazardous materials responders.* In addition, the district coordinators are covered by State liability laws and thus can provide assistance in other districts without fear of lawsuits.

Communities of all sizes are becoming more aware of the dangers associated with hazardous commodity transportation and are looking for ways to lower their risks. The same factors that influence State emergency response development also operate at the local level, with communities that have experienced

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*George Kramer, Hazardous Materials Instructor, Tennessee Emergency Management Administration, personal communication to OTA staff, Nov. 26, 1985.

Table 3-1.—Jurisdictional Analysis of Agency Responsibility

	Premarket testing	Manufacture	Handling	Storage	Use	Labeling	Package/container design	Packaging/placarding	Shipping papers	Transportation equipment	Inspections—process/storage	Inspections—transportation	Notification	Response/containment	Cleanup, mitigation, disposal	Accident reporting requirement
Federal:																
Federal Highway Administration (U.S. Department of Transportation)						X	X	X	X	X		O	O			X
Federal Railroad Administration (U.S. Department of Transportation)			X			X	X	X	X	X		X	O	O	O	X
U.S. Coast Guard			X			X	X	X	X	X	X	X	X	X	X	X
Federal Aviation Administration (U.S. Department of Transportation)			X			X	X	X	X	X	X	X	X	O	O	X
Office of Pipeline Safety (U.S. Department of Transportation)			X				X			X	X	X	X	O	O	X
National Transportation Safety Board (U.S. Department of Transportation)													X			X
Environmental Protection Agency	X	X		X	X	X		X	X		X		X	X	X	X
Federal Emergency Management Agency													X	O		X
Department of Health and Human Services		X	X		X								X			
Nuclear Regulatory Commission		X	X	X	X								X*	O*	X*	X*
Bureau of Alcohol, Tobacco and Firearms (U.S. Treasury)				X	X								X			
Department of Defense, Explosives Safety Board		X	X	X	X								X*	O*	X*	
Department of the Army														O*		
State:																
Department of Emergency Services													X	X	O	
Labor and Industry		O	O	O	O						O			O*	O	
Department of Social and Health Services		O	O	O	O						O		X*	O*	O	X
Department of Agriculture			X*	X*	X*						O		X*			
Department of Ecology		X											O	O	X	
Washington Utilities and Transportation Commission								X	X	X		X				X
Washington State Patrol								X	X	X		X	X	X	O	X
Local:																
City fire		O	X	X	X	O					X		X	X	O	
City building department		X			X											
City police										X						
County fire				O	O						O		X	X	O	
County police										X						
City/county Department of Emergency Services													O	O		
City/county health department														X		

*Denotes that scope of authority will depend on type of substance, location of spill, or identity of carrier or discharger.
X—Denotes major authority in the area of regulatory administration of enforcement.
O—Denotes limited authority in the area of regulatory administration of enforcement.

SOURCE: Hazardous Materials Demonstration Project Report—Puget Sound Region.

serious hazardous materials accidents or have large chemical plants more likely to be concerned about developing emergency response capabilities.

Communities with emergency response capabilities have set up various response systems. In rural communities, hazardous materials emergency response usually is an additional duty assigned to the fire or police department. Large metropolitan areas are more likely to train and equip specialized units. Large cities and urban areas with major transportation corridors or heavy concentrations of business and industry requiring hazardous materials may use response teams supplemented with formal mutual aid agreements with nearby jurisdictions. In fact, the emergency response capabilities in a few suburban communities may surpass the capabilities of State emergency response organizations, through the organization of mutual aid networks, consolidation of resources, and widespread community support.

However, local governments often find it difficult to justify the cost of specialized equipment, training, and manpower for events that occur rarely. Developing and maintaining a regional hazardous materials response team is a cost-effective possibility for smaller jurisdictions.

Coalitions of several communities or of industry and local government may be able to provide specialized equipment and response capabilities even for areas with severe financial restraints. Industry participation may lessen the cost to local communities and provide a level of technical expertise in hazardous materials handling, chemical knowledge, and personnel protective equipment often beyond local capabilities. Industry resources would be especially valuable in the event of an accident involving complex combinations of chemicals or unusual circumstances.

One example of a regional emergency response team augmented by public and private sector cooperation is the Gateway Response Network, organized by area governments, public services, and business and industry in the greater St. Louis region. Under the auspices of the the East-West Gateway Coordinating Council, a regional organization, the Network was formed specifically for response to hazardous materials transportation accidents. Network activities have included identifying the hazardous materials stored and transported through the region; identifying existing local and industry emergency response teams; developing a coordinated response to hazardous materials transportation accidents; and providing equipment, including a special van. The Spokane, Washington, Fire Department has a similar arrangement with the rest of Spokane County and Northern Idaho.

Industry Response

Over the past decade, hazardous materials manufacturers have evaluated their safety programs and often taken steps to address their own and the public's concerns. Industry's involvement in hazardous materials emergency response ranges from technical assistance to specialized response teams. The best known effort is the Chemical Transportation Emergency Center (CHEMTREC), established in 1970 by the Chemical Manufacturers Association (CMA). CHEMTREC maintains an on-line database on the chemical, physical, and toxicological properties and health effects of the thousands of products of the member companies.

Personnel at the scene of an accident call CHEMTREC with information on the accident and the material involved. CHEMTREC staff provide chemical information for use in onsite decisionmaking and notify the manufacturer of an accident involving their product.

CMA has also developed CHEMNET, a mutual aid network of chemical shippers and for-hire contractors to advise and assist at chemical spills during transportation. CHEMNET is used to identify members of CMA with particular chemical expertise to assist in emergency response efforts.

Many large petrochemical and chemical manufacturers train and maintain company emergency response teams for both their fixed facilities and transportation accidents. A team may respond itself to a report of an accident involving a company product or, under formal agreements, may request another participating company closer to the incident to respond. Industry teams are instructed to defer to the local on-scene commander at an accident so that the emergency response effort remains coordinated.[5]

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[5] E.E. Eigenschenk, Mid-Continent Distribution Manager, Shell Oil Co., personal communication with OTA staff, June 4, 1985. The American Petroleum Institute recommends that a particular procedure, known as practice 111.2, be part of emergency response plans.

The Channel industries, the Pesticide Safety Team Network, and Chlorep are other examples of emergency response capabilities provided by industry. The Channel industries in Houston have extensive mutual aid agreements with each other. By pooling resources, this concentration of chemical industries along the Texas Channel can assemble 500 firemen and other trained personnel, some 60 water pumpers, 45 chemical retardant fire trucks, and 12 truck-mounted powerplants.

The Pesticide Safety Team Network (PSTN) and Chlorep, specialized information and emergency response units, were formed by manufacturers to respond to accidents involving pesticides and chlorine. PSTN, a voluntary effort established in 1970, consists of 50 to 60 response teams. When a pesticide accident occurs, someone at the site notifies CHEMTREC, which in turn notifies one of 10 PSTN regional coordinators. The coordinator then contacts personnel at the accident site to determine what response is needed. If telephone advice is not sufficient, the manufacturer is notified and responds accordingly. Approximately 90 percent of pesticide manufacturers respond to accidents involving their product.[6] If a manufacturer is unable to respond, the closest safety team will be dispatched to respond to the incident and handle cleanup. Cleanup costs are absorbed by the participating team.

Chlorep, a response network of chlorine manufacturers and packagers, responds to emergencies involving chlorine products. Founded in 1972 by the Chlorine Institute, Chlorep currently includes 37 manufacturing and 31 packaging companies among their response network members.

With its specialized resources, detailed knowledge of hazardous materials, and extensive product information, industry can provide a logical adjunct to public safety capabilities for fixed facility and hazardous materials transportation emergency response.

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[6] Lawrence Norton, National Agricultural Chemical Association, personal communication with OTA staff, Aug. 30, 1985.

TRAINING

Widespread and improved emergency response training at the State and local levels using uniform standards is the major need identified in all DOT demonstration projects, in OTA's research, and by congressional concern.

The effectiveness of current training programs is uneven because:

- a wide range of response personnel need training, and only some currently receive it;
- numerous separate organizations offer differing courses; and
- the content and quality of training courses is diverse.

Existing Training Programs

Under the 1984 Hazardous Materials Transportation Act reauthorization, Congress required DOT and FEMA to survey training programs offered for hazardous materials emergency response and enforcement activities. Final results of these surveys are anticipated in January 1986. To date, some 700 agencies, public and private, have been identified as offering some form of hazardous materials training or planning. Of these, 574 offer training in planning and response; 297 provide training in enforcement and compliance.[7] However, public expenditures for training are directed primarily at compliance and enforcement activities rather than at emergency response. (The OTA final report, *Transportation of Hazardous Materials*, will provide further details.)

At the Federal level, a myriad of training programs related to different aspects of hazardous materials emergency response are conducted by FEMA, DOT, EPA, DOE, NRC, the Department of Defense (DOD), and the National Institute for Occupational Safety and Health (NIOSH), at both national and regional locations. Although representatives of many of these agencies meet regularly as members of the National Response Team, a single, strong Federal strategic approach to emergency response training has not been achieved.

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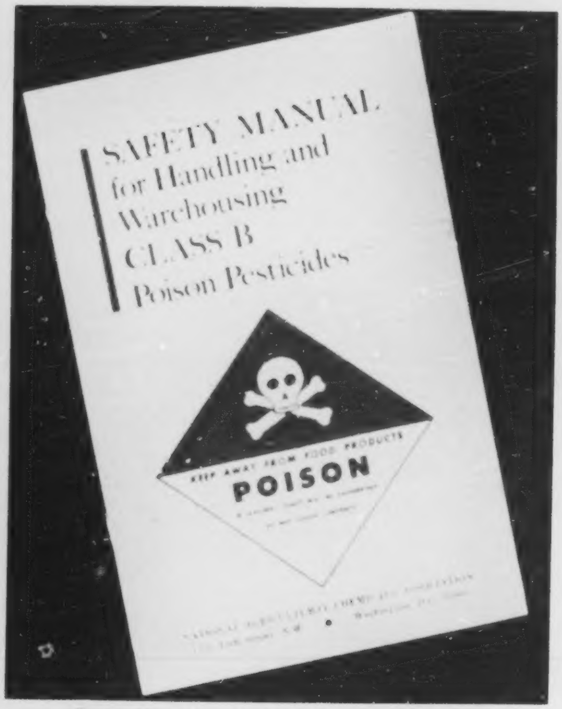
[7] Douglas Stancell, Transportation Programs, Science Applications International Corp., Oak Ridge, TN, draft study, Department of Transportation/Federal Emergency Management Agency.



SAFETY MANUAL
for Handling and
Warehousing
CLASS B
Poison Pesticides

KEEP AWAY FROM FOOD PRODUCTS
POISON

Photo credit: Research and Special Programs Administration, DOT

Many industry resources are available to assist emergency response personnel.

For example, training courses offered by executive branch regulatory agencies, such as DOT and NRC, concentrate on enforcement aspects of hazardous materials transportation regulations. Agencies such as DOE, EPA, and NIOSH offer training in the aspects of hazardous materials directly related to their own areas of responsibility.

FEMA, the lead agency for Federal emergency management, offers specific hazardous materials emergency response training programs at the National Fire Academy in Emmitsburg, Maryland; at FEMA regional headquarters; and around the Nation through its "Train the Trainer" courses.

Hazardous materials emergency response training programs offered at the State level are generally the responsibility of the State fire marshal's office, the State fire training agency, or the major emergency preparedness agency. The courses differ from State to State, although if the State trainers have been trained by FEMA, greater course uniformity can be expected.

There are few formal training programs for emergency responders at the local level and those that do exist may involve courses at a neighboring community college or informal in-house training.

Industry training, offered by individual shippers, manufacturers, and associated professional organizations, typically covers hazardous materials emergency response for both fixed facilities and transportation accidents. While intended primarily for company employees, these courses may include provisions for training local public response personnel. For example, major companies may donate equipment and invite local first responders to observe their training sessions; Shell Oil and Amoco are among the companies that have such programs. Training offered by national professional and industry associations includes programs by the National Fire Protection Association, the American Petroleum Institute, the National Agricultural Chemical Association, and the Chemical Manufacturers Association. State associations may also have training programs. For example, the Pennsylvania Motor Truck Association provides training for every Pennsylvania State patrolman.

Photo credit: Shell Oil Co.

This petroleum industry training course teaches response personnel to prepare an overturned tank truck for offloading the product before the truck is righted.

Training that covers rail hazardous materials emergencies is usually offered by railroad companies to employees, shippers, and invited local emergency responders. Emergency response training for highway hazardous materials accidents is offered by shippers and carriers as well as State and local governments.

OTA tallied results of a survey conducted by the International Association of Fire Chiefs in June 1985 on hazardous materials team response capabilities across the Nation. Table 3-2 shows the training sources most frequently used by State and local emergency responders.

No systematic way exists to ensure that existing emergency response training courses reach those who need the training. In telephone interviews with OTA staff, State training officers voiced frustration at the lack of information they receive on the quality of available training resources and the lack of communication with their counterparts in other States. Moreover, some local officials are concerned that planned State programs are inadequate to meet the needs of local jurisdictions. A national network of hazardous materials emergency response trainers and a national clearinghouse for training information are two relatively low-cost means of addressing these concerns.

Training Needs

The population needing hazardous materials response training is numerous and diverse. Local fire or police department personnel are usually the first to respond to a hazardous materials transportation accident, and their training is of primary importance. However, personnel from other groups often participate in response activities and require training as well.

Table 3-2.—Frequently Used Training Sources, 1985

Training course	Number of State and local hazardous materials team attendees
National Fire Academy	79
Industry (unspecified)	68
State training programs	65
Colleges or universities	59
Safety Systems, Inc.	53
Texas A&M	25
In-house training	21
Colorado Training Institute	18
Radiological Monitoring	18
National Fire Protection Association	17
EPA	17
U.S. Coast Guard	13
Union Pacific/EPA Region VII	7
Other	33

SOURCE: International Association of Fire Chiefs survey, June 1985; and the Office of Technology Assessment.

The National Fire Academy reports there are approximately 1,200,000 firefighters nationwide, 85 percent of whom are volunteers, and the remaining 15 percent paid employees of municipal, county, or local governments.[8] According to the National Association of Chiefs of Police, there are between 480,000 and 500,000 local sheriffs and police personnel employed by State and local governments.[9]

Civil defense volunteers and health professionals also may respond to hazardous materials transportation accidents. Approximately 223,600 emergency medical technicians are registered nationally.[10] These individuals need some training in assisting victims of hazardous materials accidents.

State and local government officials and emergency service agencies say that it is the inappropriate responses of untrained or poorly trained first responders of a predominantly volunteer force that are most likely to harm the first responders themselves and the surrounding community. According to reports of professional associations involved with emergency services, many first responders do not have access to training. In addition, the 25 percent annual turnover rate within fire departments increases the difficulty of maintaining a trained emergency response force.[11]

Coordinated efforts to train potential first responders in rural and small urban areas are necessary. The training should emphasize the differences between hazardous materials response and firefighting. While firefighters rush to the scene, hazardous materials responders must identify the product and the potential damage, and the appropriate response, before approaching the accident. Training in the application and use of protective equipment is also important.

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[8] Ray Donovan, National Fire Academy, Federal Emergency Management Agency, Emmittsburg, MD, personal communication with OTA staff, 1985.

[9] Gerald Arenberg, Executive Director, National Association of Chiefs of Police, personal communication with OTA staff, 1985.

[10] National Registry of Emergency Medical Technicians, *Registry: The Newsletter of the National Registry of Emergency Medical Technicians,* vol. 17, No. 1, winter 1985, p. 7.

[11] Chief Warren Isman, Fairfax County Fire Department, Fairfax County, VA, personal communication with OTA staff, 1985.

In addition, police departments and emergency medical personnel, as well as public health departments, public works departments, and environmental health departments need to know how to handle hazardous materials emergencies. Hazardous materials training, protective equipment, and decontamination procedures should be added to training for ambulance drivers, hospital personnel, emergency room physicians, nurses, and orderlies. As part of a DOT demonstration project, Memphis organized a full-scale accident simulation to evaluate emergency medical capabilities. It became apparent that emergency medical services and hospital personnel were not familiar with treatment of chemical injuries or the need for decontamination after chemical exposure. It is likely that many hospitals and hospital emergency rooms suffer from this same lack of knowledge.

Training Content and Quality

Defining the needs of first responders and examining how these needs are being met has not yet been systematically undertaken. Development of a uniform comprehensive training program for emergency response activities hinges on unified national or Federal attention, rather than on piecemeal efforts at the State or local level.

State and local officials have suggested that a systematic approach to training first responders should include:[12]

- a curriculum based on a clearly defined job analysis that identifies what personnel should know regarding hazardous materials management;
- cross-training for each of the groups needing training (fire, police, industry, Federal, and State personnel) in the vital areas of response enforcement and compliance;
- well-qualified and expert hazardous materials trainers; and
- a clearinghouse or coordinator for hazardous materials training to identify useful training courses for particular needs.

The identification of available training programs, such as the surveys undertaken by DOT and FEMA, is a preliminary step in the development of a comprehensive emergency response training program. Interim survey results document a spectrum of training programs offered by Federal, State, and local agencies; private companies; and industry.

Training for emergency response to hazardous materials incidents must cover the regulatory requirements of hazardous materials transportation, including proper substance identification, shipping papers, placarding, and emergency notification procedures. Training in these requirements is offered by DOT, DOE, DOD, and NRC.

Most DOT training programs stress enforcement of regulations, including placarding recognition and use of the DOT Emergency Guidebook, rather than direct emergency response procedures. The U.S. Coast Guard offers classes in hazardous materials regulatory compliance to shippers and carriers, and emergency response training to Coast Guard personnel and other emergency responders for water-related hazardous materials transportation problems.

EPA offers training on hazardous materials emergency response at regional headquarters. The training focuses on hazardous materials chemical and physical properties, advanced emergency response techniques, and cleanup activities.

In the past, FEMA training programs focused primarily on training for emergency response to radiological accidents; new emphasis is now being placed on emergency response to hazardous materials accidents. A six-part monthly teleconference series sponsored by FEMA and the National Fire Academy, being held between September 1985 and March 1986, covers a variety of emergency response issues, including planning for and responding to hazardous materials emergencies.

State officials, in conversations with OTA staff, indicated that the basic first responder training courses offered by most States include recognition and identification of hazardous materials. Many State training officers contend, however, that existing first responder training courses are too superficial to prepare first responders adequately for hazardous materials transportation accidents.[13] They urge the establishment of national guidelines for different levels of emergency response training, for training course content, and personnel requirements.

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[12] U.S. Congress, Office of Technology Assessment, "Transcript of Proceedings—OTA Workshop on State and Local Activities in Transportation of Hazardous Materials," Washington, DC, May 30, 1985.

[13] Personal communication of OTA staff with training officials in 35 State fire academies, June 25-July 20, 1985.

Local training for emergency responders varies widely, reflecting the importance placed on hazardous materials emergency response by the State government and the financial resources available. The spectrum of local hazardous materials training courses ranges from well organized and funded hazardous materials courses offered by highly trained individuals to little or nothing.[14] [15]

Because of the large volumes transported, petroleum products are the most likely hazardous materials to be involved in accidents. Most first responders already have extensive experience in dealing with petroleum product accidents, regarding them as an extension of firefighting duties. Therefore, State and local training programs may need to concentrate on those hazardous materials first responders have not previously encountered, particularly corrosives and other commodities. An inappropriate response to an accident involving unfamiliar chemical products could endanger individuals, the entire team, or the surrounding community.

One example of a public-private agency cooperative training program is that between EPA and the Union Pacific Railroad in EPA Region VII. A 2-day training course in hazard identification and approach is offered free of charge to multidisciplinary groups with emergency response duties. The course emphasizes that emergency response to hazardous materials incidents is unlike routine fire suppression in several ways; for example, response personnel must identify the types of hazards facing them before approaching the accident or attempting rescue missions.[16] The course is offered throughout Region VII to maximize involvement by first responders. Although other EPA regions have expressed interest in the course, this program is unique to Region VII.

Other successful training courses around the country concentrate on training individuals, organizing the individuals into teams, staging simulation hazardous materials accidents, and involving other agencies in simulated emergency response. These simulations provide an opportunity to test emergency response plans and discover organizational problems prior to an actual hazardous materials accident.

Recent innovations in the presentation of emergency response training include the National Fire Protection Association's television broadcasts of emergency response training and the six FEMA teleconferences. Such programs, available free to appropriate groups across the country, can deliver training at low cost to large numbers of first responders wherever television satellite reception can be arranged.*

Another innovative emergency personnel training program is offered through the National Highway Traffic Safety Administration. If requested under the State and Community Highway Safety Grant Program, receipt of Federal highway funds is linked to meeting emergency medical service training requirements. A similar program could be instituted for hazardous materials first responder training.[17]

PLANNING AND ORGANIZING FOR EMERGENCY RESPONSE

Emergency response plans, if properly implemented, can organize and coordinate the response activities of a variety of agencies. Communities concerned about hazardous materials transportation accidents are developing hazardous materials emergency response plans that utilize community resources.

Although hazardous materials truck movements probably dominate State and local planning and training, well-prepared State and local emergency response plans will address hazardous materials transportation by all relevant transport modes. According to 1983 rail waybill statistics, railroad shipments of hazardous materials, bulk shipments of petroleum products, chemicals, pesticides and herbicides, and occasionally spent fuel elements, reached 73.1 million tons, or 5.4 percent of all rail tonnage.[18] Barge movements of hazardous materials include bulk loads of petroleum and petroleum products, coals, and chemicals and chemical products. In 1981 to 1982, 66 percent of total water freight movements were hazardous materials.[19] Airborne shipments, the smallest percentage of hazardous materials movements, are generally radioisotopes, valuable commodities, and sensitive materials requiring rapid delivery.

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[14] Association of Bay Area Governments (ABAG), *National Directory of Hazardous Materials Training Courses* (San Francisco, CA: March 1985), p. 8.

[15] Data supplied by the International Association of Fire Chiefs to OTA.

[16] Charles Wright, lecture at Hazardous Materials First Responder Course presented by Union Pacific Railroad and U.S. Environmental Protection Agency Region VII.

*For further information call Mary Ellis at FEMA at (202) 646-2692.

[17] Hal Butz, Department of Transportation, National Highway Traffic Safety Administration, Enforcement and Emergency Response Division, personal communication with OTA staff, June 25, 1985.

Radioactive materials constitute only a small percentage of hazardous materials; in the past they have been the focus of many federally-funded State emergency response planning programs. DOT statistics show, however, that the transportation of gasoline, fuel oil, and other petroleum products is far more likely to cause damage to public property and the environment than radioactive materials. This suggests that hazardous materials planning activities should encompass these familiar materials.

Planning for emergency response is recognized by State and local governments as indispensable in developing more coordinated and effective response activities. As identified by State and local governments, the primary areas needing attention during planning include:

- improved coordination among Federal, State, and local agencies at every level;
- coordination with industry response programs;
- advance agreement about who is in charge;
- adequate communication between the accident site and off-site command posts;
- other operational concerns; and
- public information.

Coordination

Development of better coordination among Federal and State emergency response agencies would ease many planning-related problems facing State and local emergency responders. Issues needing a coordinated approach include: funding for emergency response training and planning; information dissemination on appropriate hazardous materials emergency response procedures; and a clear delineation of Federal, State, and local hazardous materials emergency response capabilities and responsibilities.

At the State, regional, or local level, plans that outline specific responsibilities, coordinate on-site activities, and appoint a response leader can reduce the confusion at the accident site and provide a clear chain of authority for response activities. Fire, police, and other organizations that may participate in emergency response should be part of the planning process to establish the lead agency in emergency response situations. Any governmental mutual aid agreement should determine the on-scene coordinator in advance.

Industry has contributed to many local emergency response activities, but questions remain regarding emergency response on private property, such as a company facility or a railroad right-of-way. Advance arrangements between special industry response teams and existing public emergency response networks as to these issues will enhance response efforts. Formal mutual aid agreements between independent industry response teams and communities are a means of achieving coordinated and comprehensive response capabilities at reduced expense. They allow neighboring communities to share equipment, fire and police department manpower, emergency medical services, and private sector resources. A recent effort, the CMA's Community Awareness and Emergency Response Program, encourages industry to cooperate in the development of community emergency response plans.

Operational Concerns

Communication and liability issues should also be covered during the planning process. Communication is vital in any emergency and involves both hardware and organization. At the planning stage, participating response agencies should identify equipment requirements and procedures to ensure adequate communication, both on and off site, equipment compatibility, and isolation of frequencies for emergency use.

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[18] Mark Abkowitz and George List, "Hazardous Materials Transportation: Commodity Flow and Incident/Accident Information Systems," OTA contractor report, October 1985.

[19] The American Waterways Operators, Inc., *American Waterway Operators Annual Report: 1981-1982* (Arlington, VA: 1983).

In addition, some currently available resources do not correspond to the needs of State and local responders. Additional information on the degree of hazard for hazardous commodities, especially identification of the chemicals most dangerous to first responders and the community at large, would enable planners and responders to assess risks more readily. Hazardous commodities are immediately identifiable to emergency responders if correctly placarded as radioactive materials, poisons, etiologic agents, flammables, combustibles, oxidizers, corrosives, caustics, explosives, and pyrophoric materials. Within these categories, some substances are much more dangerous than others. Additional indication of the relative degree of hazard has been of concern to State and local government officials and emergency responders since 1970. Adoption of the United Nations numbering system, a classification and identification system developed for international commerce, does not address the problems the current system poses to hazardous materials emergency responders, although it provides a uniform numerical identification when it is used.

One example of the need for gradations of hazard is the categorization of methyl isocyanate (MIC), responsible for more than 2,000 deaths and thousands of injuries to residents of Bhopal, India. For years, MIC has been classified only as a flammable material by the Department of Transportation. Only recently has DOT changed its designation and placarding and handling requirements to indicate the dangers of inhalation.[20]

The DOT *Guidebook*, the most widely available response information resource, may provide incomplete information about a substance, as it did in the Odessa, Delaware, spill. Moreover, the components of hazardous waste, a combination of materials that form a volatile mixture or pose multiple hazards, are not fully identified.

The high violation rate found among hazardous materials transporters of placarding, shipping papers, and marking regulations also concerns emergency response personnel. First responders must often assess the risks of the hazardous materials and make decisions on response procedures based on incorrect or incomplete information, potentially endangering themselves and neighboring communities.

Another growing concern of hazardous materials teams and local governments is disposal of hazardous materials and contaminated soil, etc., following cleanup. An emergency response team left in possession of removed materials becomes a generator, storer, and transporter of hazardous waste subject to Federal hazardous waste requirements.

Liability issues are a concern for governmental entities, which may be held responsible for emergency response activities that result in damages. Carefully crafted Good Samaritan laws can relieve the burden of potential liability for qualified emergency responders who assist during a hazardous materials transportation accident. Industry liability after response to hazardous materials accidents remains a major industry concern.

Public Information

Providing accurate reports to the press and public is another necessary part of coordinated emergency response activities. At many accidents, particularly severe ones, the media becomes a part of the response process and is an important public information resource. Although most communities recognize the importance of public information in the emergency response process, media representatives are not typically included on planning task forces.

A training course for press personnel on dealing with bad news* stresses the need for careful advance planning and a clear strategy for providing an accurate information flow to the media and to the public. Emergency response plans should include designating spokespersons skilled in giving print and electronic media interviews. The first media contact can determine how the incident is perceived by the public and can help maintain public calm and cooperation.

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[20] *Washington Post*, "Chemical Shipping Rule Issued," Oct. 10, 1985.

*For example, Lehigh University Journalism Department and Office of Continuing Education in Pittsburgh, PA, offers a training course in press management of emergency situations.

PROTECTIVE EQUIPMENT

Emergency equipment is the primary protection and defense for first responders handling hazardous materials. The equipment must be adapted to a particular hazard in that it must be made of materials that are resistant to the hazardous chemical; and it must protect those areas and functions of the human body susceptible to the hazard.[21]

The lack of useful information on the appropriate type of personal protective equipment and procedures for its use is a major concern for local governments and emergency service personnel. The appropriate choice among the varieties of equipment offered and the numerous operating procedures available depends on the hazardous materials being handled, and those responsible for equipment purchase are faced with difficult and expensive options.

The cost of protective suits ranges from less than $100 for a disposable Tyvek coverall to approximately $2,000 for a chemical splash suit with inner and outer suit protection. Self-contained breathing apparatus, important for incidents involving unknown chemicals or known highly hazardous chemicals, may cost $1,400 each. In combination, these types of equipment, used properly, produce a high level of protection for emergency responders. However, the cost of such equipment is far beyond the budgets of many small communities.

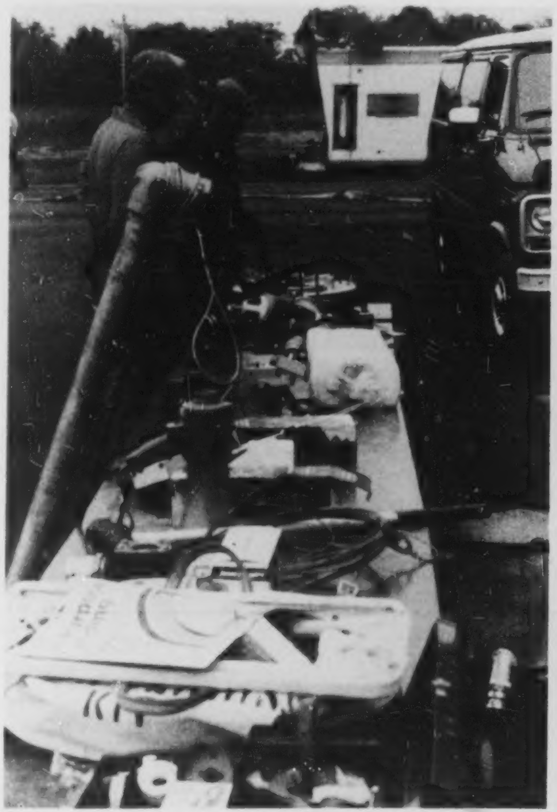

Photo credit: Shell Oil Co.

Emergency response personnel must become familiar with equipment during training before an accident occurs.

Moreover, no existing protective clothing is resistant to all classes of hazardous materials. Thus, the selection of chemical protective equipment requires assembling equipment components—gloves, headgear, coveralls—that offer similar ranges of chemical protection. Firefighters and hazardous materials response teams currently rely on fire service literature, manufacturer information, and accumulated personal expertise when selecting chemical protective gear. Firefighter gear is only now being tested for chemical resistance, however. To provide effective protection, equipment must fit properly, be used correctly, and be maintained appropriately. In the course of their activities firefighters and other emergency responders will be exerting themselves, altering the fit and possibly reducing the effectiveness of clothing and respirators. For these reasons, emergency responders must be provided with training and explicit guidelines on the purchase, use, and maintenance of respiratory protective equipment.

The development of equipment standards, purchase recommendations, and equipment training programs by a national body, either the Federal Government or professional associations, would provide local emergency responders with a body of knowledge from which to make accurate and informed decisions.

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[21] A.D. Little Co., "Protective Clothing and Equipment," *Chemical Hazmat Response Information System (CHRIS) Response Methods Handbook* (Washington, DC: U.S. Coast Guard/U.S. Department of Transportation, December 1978), p. 7-1.

FINDINGS

- **Additional training for public safety personnel in hazardous materials emergency response is urgently needed.** No comprehensive framework for emergency response training activities exists today at the Federal, State, or local level, resulting in insufficient attention to and funding for training activities.
- **Movements of gasoline and petroleum products (which constitute 50 percent of the hazardous materials transported) account for more hazardous materials transportation accidents, injuries, and damages than other classified commodities.** Most emergency response personnel are adequately trained to fight petroleum fires. Nonetheless, given the magnitude of the problem, planners, enforcement officers, and industry representatives should develop additional safety measures and awareness and training programs for drivers and handlers to reduce the incidence of such accidents.
- **Movement of corrosives and other hazardous materials that pose special hazards are of concern to State and local officials.** Emergency response personnel and planners should include industry in the development of appropriate response procedures and training programs that reflect the inherent dangers of these substances.
- **The most pressing nationwide training need is for intensified training for first responders.** First responders have initial responsibility in the mitigation of an incident or accident and need to be trained accordingly. Course offerings are currently weighted in favor of advanced instruction, leaving first responders inadequately informed. A multidisciplinary approach that includes all the agencies involved in first response is an important aspect of this training.
- **Additional and advanced training is appropriate for public safety personnel in large jurisdictions, along major transportation corridors, or in States with heavy concentrations of hazardous materials industries.** Funding assistance for training will be necessary for many jurisdictions, either from Federal or State programs or from user or registration fees.
- **Safety information accompanying hazardous materials often is not sufficient to enable emergency responders to protect themselves or the surrounding public in the case of an accident.**
- **Determining in advance who is to be in charge at an incident and the role(s) of each participating agency is imperative for an effective response.**
- **Good communication during emergencies requires adequate hardware and advance planning and coordination.**
- **National guidelines for appropriate protective clothing for specific hazardous materials emergencies are needed,** as hundreds of types of personal protective equipment are available for a variety of hazardous materials.
- **National guidelines for equipment standards and for training in equipment use would provide emergency response teams and public safety personnel with adequate skills and tools for a safe response.** Instruction in the maintenance, inspection, testing, and decontamination of personal protective equipment should be included in training programs.
- **Development of performance objectives for emergency response personnel would help standardize training and response.**
- **Hazardous materials emergency response training should include all transportation modes.**

Chapter 4

Information Gathering for State and Local Hazardous Materials Planning

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Information Gathering for State and Local Hazardous Materials Planning

Planning to prevent accidents and to improve emergency response requires information on the nature of hazardous materials accidents that might occur, the areas of highest risk, and the types of materials most likely to be involved. Until recently, State and local officials had scant information of this sort, but many have now initiated studies documenting the amount and types of hazardous materials stored within or moving through their jurisdictions to help develop plans for accident prevention and emergency response. This chapter describes State and local efforts to gather and analyze hazardous materials data for planning purposes and identifies related issues.

The impetus for gathering information and planning is often a hazardous materials incident for which a jurisdiction found itself ill-prepared. A 1979 chemical plant fire in downtown Memphis prompted the mayor to initiate a planning and data collection program. When Memphis became a part of a U.S. Department of Transportation (DOT) demonstration program, the city used DOT funds to expand and refine the effort. Release of phosphorous trichloride from an overturned railroad car in Somerville, Massachusetts, caused 400 people to seek medical attention and was the catalyst for the Commonwealth to undertake a planning study with the goal of improving emergency response procedures. Other jurisdictions have become sensitive to the danger of hazardous materials accidents because they are transportation centers or major corridors of hazardous materials traffic.

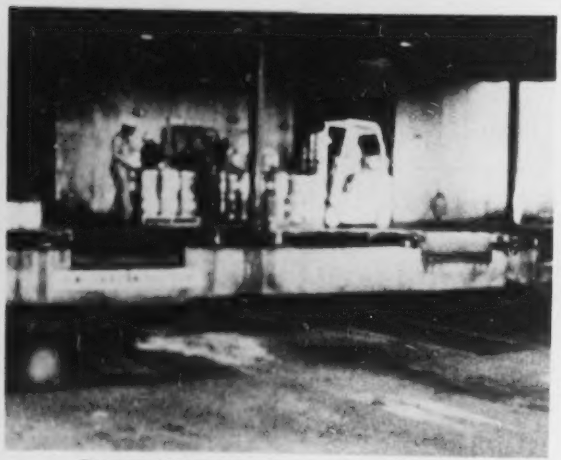

Photo credit: Research and Special Programs Administration, DOT

Information on the type of hazardous materials stored for distribution in a community is important for planning and emergency preparedness.

Starting in 1981, the Office of Hazardous Materials Transportation within DOT sponsored studies in seven jurisdictions on a wide range of issues related to hazardous materials transportation; these studies were to lead to development of comprehensive management plans to serve as models for other localities. The seven jurisdictions were: the Central Puget Sound Region; the San Francisco Bay Area; Indianapolis; Memphis; New Orleans; Niagara County, New York; and the Commonwealth of Massachusetts. The sites represented a range of population sizes, locations, types of political units, and levels of existing planning. All plans covered four general topics: hazard identification, assessment of local capabilities, prevention, and response. Each plan reflects local economic conditions, perceived needs, and other demographic characteristics.

To collect information for this chapter, OTA examined a variety of sources. The seven DOT demonstration projects and the studies carried out by States under the State Hazardous Materials Enforcement Development (SHMED) Program were particularly valuable. So, too, was a multimodal study prepared for Virginia, which represents an early attempt by a State to collect comprehensive information on hazardous materials movements by all modes of transportation. At the municipal and regional level, OTA reviewed a hazardous materials transportation study recently completed for the New York City area and the preliminary results of studies now in progress in Houston and Denver. In addition, federally funded studies of monitoring and enforcement ef-

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forts for transport of radioactive materials were examined.

States that have undertaken hazardous materials data collection and planning studies have used a variety of Federal funding sources, including SHMED program monies and Federal Highway Administration (FHWA) planning funds, as well as their own resources. However, aside from the DOT demonstration sites, local governments have found funding such studies difficult. No Federal program currently exists specifically for local planning studies, and State planning efforts remain concentrated at the State level.[1] State responsibility for planning is often scattered among several departments, complicating local officials' efforts to obtain funds. Planning officials complain that they cannot get local funds for accident prevention and emergency response planning until an accident occurs. All local planning studies and data collection efforts have depended primarily on outside financial support. Typically, little or no information is gathered prior to receiving a funding grant, and once the grant expires, sustaining staff efforts becomes difficult. OTA found that acquiring data for planning remains a significant problem for many local jurisdictions.

DATA COLLECTION ACTIVITIES

Federal Data Collection

Numerous Federal offices have responsibility for hazardous materials data collection, although only those relevant to State and local needs are discussed here. DOT information-gathering efforts include:

- Research and Special Programs Administration, Office of Hazardous Materials Transportation: collects data on incidents (spills) by all modes except bulk water.
- U.S. Coast Guard: collects accident and spill data for waterborne commerce.
- Federal Railroad Administration: collects rail accident data.
- Federal Aviation Administration: collects data on aviation accidents and spills.
- FHWA, Bureau of Motor Carrier Safety: collects accident and incident data on highway transportation.

The Bureau of the Census and the Interstate Commerce Commission collect commodity flow data. The Census Bureau's Commodity Transportation Survey contains useful multimodal information on all commodity shipments, but, as it is conducted only once every 5 years, its information is not current. Furthermore, it is difficult to extract information on hazardous materials shipments. In addition, the information requested of the responders varies with each survey, so trend analysis is difficult. The Interstate Commerce Commission collects railroad waybill data, which can be analyzed to yield commodity flow data about hazardous materials shipped by rail.

The format of each of these commodity flow databases makes them so difficult to compare that they are not useful to State and local governments. For example, hazardous materials information is not distinct from other commodities; identification of the commodities is often too imprecise to determine whether hazardous materials is involved; there is no information on routing; the codes used to identify the hazardous materials commodities are not the same in each database; and no officially recognized cross-reference table exists to permit integration of data from different databases.

State and Local Studies

No single best approach to State and local data collection emerged from OTA's research. When a State undertakes a study, a lead agency is usually designated, often the Department of Transportation or State Police, with assistance provided by an office of emergency preparedness or comparable agency.

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[1] Thomas White, City Council member, Greenbelt, MD, in U.S. Congress, Office of Technology Assessment, "Transcript of Proceedings—OTA Workshop on State and Local Activities in Transportation of Hazardous Materials," Washington, DC, May 30, 1985, p. 155.

For cities, municipal planning staffs, private consulting firms, or university-based research groups do most of the data gathering and analysis. For example, a New Orleans planning study was conducted by a member of the mayor's staff hired with grant funds, and the knowledge accumulated during the study continues to be a major asset for the city. Fire departments are the other local public agency most frequently involved in data gathering.

Techniques and results vary according to the local situation and experience and the particular interests and resources of the agencies involved. Nonetheless, it has been possible to identify the types of data that have been found useful, effective methods, and commonly encountered problems. The following kinds of studies have been found to provide the background information necessary for planning and emergency preparedness:

- **Inventory of hazardous materials stored at fixed facilities:** Records the quantity and type of hazardous commodities stored in manufacturing, wholesaling, distribution, or storage facilities within the jurisdiction. Data are obtained by means of questionnaires, interviews, and inspections, and from public records, such as fire inspection records and business tax records.
- **Hazardous materials transportation analysis:** Identifies the quantities and types of hazardous materials transported through the jurisdiction by each transportation mode and the most frequently used routes. Data are gathered by questionnaires, roadside inspections, and review of company records.
- **Hazards assessment or identification of hazards and high-risk locations:** Analyzes factors such as population density, transportation system characteristics, and past incidents to determine where the risk of a hazardous materials incident is greatest or where the impact would be the most severe.

An inventory of fixed facilities is usually the first step in the data-gathering process. Any second step is usually a transportation analysis. Hazards assessment is usually last since it draws on data collected in the first two studies.

FIXED FACILITIES INVENTORIES

Knowledge of the extent and nature of hazardous materials manufacture and storage in the community is essential for prevention and response planning. Local governments have found that a facilities inventory can guide the purchase of equipment, conduct of training, location of response facilities, and assignment of personnel; and it provides a good indication of the type of hazardous material transported in the jurisdiction. Despite the importance of data on fixed storage sites, however, none of the seven jurisdictions taking part in the DOT demonstrations had previously compiled this information, although some had partial data as a result of regulatory requirements pertaining to nuclear materials, hazardous wastes, air pollution, or routine fire inspection procedures.

Local and Regional Inventories

One of the first decisions necessary in undertaking a hazardous materials inventory is what should be inventoried and in what detail. Some jurisdictions studied by OTA chose to locate all hazardous materials, including paint thinner stored in retail stores, but concentrated most on chemicals manufactured or stored in bulk. Memphis, for example, limited its inventory to 255 manufacturing sites.[2] At the other extreme, the cities of Santa Clara County, California, inventoried all materials identified by DOT as hazardous and stored in any quantity at commercial facilities, including drug stores.[3] The inventory is now kept current by the county. The majority of communities studied, however, have limited their surveys to selected commodities identified by the staff and advisory committees and to major facilities, measured by employment levels.

The Association of Bay Area Governments, around San Francisco, identified target commodi-

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[2] National Conference of State Legislatures, October 1983-December 1983, *Hazardous Materials Transportation Regional Workshops* (Denver, CO: 1983), p. 65.

[3] Cambridge Systematics, Inc., *Community Teamwork—Working Together to Promote Hazardous Materials Transportation Safety* (Washington, DC: U.S. Department of Transportation, 1983), p. 6.

Box 5A.—The Inventory Process in the Puget Sound Region

The Puget Sound Region prepared a thorough inventory as part of its hazardous materials plan. Planners collected data on the quantities of selected hazardous commodities stored in local manufacturing firms and tabulated the information by zip code districts. The following steps were involved:[4]

- With the advice of a local advisory committee, the project staff narrowed the scope to 85 commodities on the DOT hazardous materials list. The materials were selected because they were prevalent in the region and very hazardous.
- The staff identified the types of manufacturing firms, according to Standardized Industrial Classification (SIC) codes, that most frequently used the 85 commodities and obtained the addresses of the firms from local business directories.
- Questionnaires were sent to manufacturers, as well as shippers and carriers, requesting information on the name of commodity stored, net weight of annual production, number of shipments, and origin and destination of shipments.
- The information from the questionnaires was mapped by zip code to show concentrations of types of hazardous materials, and regional tabulations were compiled to show what hazardous materials were most common.

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[4] Puget Sound Council of Governments, Seattle, WA, *Central Puget Sound Region Risk Analysis Report: Regional Hazardous Materials Inventory*, interim report (Washington, DC: U.S. Department of Transportation, 1980), p. 30.

ties but did not have the budget or manpower to administer the manufacturer and shipper questionnaire. Instead, Bay Area planners produced a series of small maps, showing the locations of manufacturing firms that frequently used the selected group of hazardous materials, anticipating that each county would eventually survey individual firms.[5]

In Memphis and Indianapolis, the initial data collection method was a questionnaire. Memphis identified 900 firms as potential hazardous materials storage sites. By eliminating the smallest firms on the advice of the local advisory committee and the fire department, the staff narrowed the list to 255 firms. Questionnaires sent under the auspices of the Memphis Fire Department asked for data on storage of material in 19 DOT hazard classes. Although followup to the questionnaire was a lengthy process, the city currently has information on the type, quantity, and location of stored hazardous materials, including site plans and names, addresses, and phone numbers of emergency contacts.[6] In Indianapolis, only 20 to 25 percent of the 1,200 local industries surveyed submitted responses to the questionnaire. The majority of manufacturers declined to participate because of their concern that the data might divulge proprietary information or that the time necessary to compile the data would be excessive. More recently, Indianapolis planners, in cooperation with the city and suburban fire departments, have prepared a simplified hazardous materials information form that they will ask manufacturers and distributors to complete. City staff pointed out to OTA that the fire departments now collect such detailed information as part of their fire prevention duties and that, as a result, they have established a good relationship with industry in the Indianapolis area.

Santa Clara County collects information by means of a regulatory procedure, which also finances the hazardous materials control program. To obtain a business license, all firms selling, using, or producing hazardous materials must provide local officials with an inventory and pay a fee based on the amount of materials stored. The fees help support the county's emergency response team and hazardous materials inspections. Local manufacturers and merchants are advised on the proper storage and handling of hazardous materials during these inspections.

Coordinated Use of Inventories

Inventories can provide information for many purposes in addition to planning. The Multnomah County Fire Department in Oregon collects information on hazardous materials storage at fixed facilities as part of routine fire inspections. The county's Office of Emergency Management stores the information in a computer along with data on chemical characteristics of the commodities, transportation routes frequently used, and performance profiles of major carriers. The county's specialized hazardous materials team has access to this database through a computer terminal located in the response vehicle. The computer system can provide information on where a specified product can be found at the site, how it is stored, and other chemicals that may be present. The system also provides information on the characteristics of all the chemicals known to be in the county, based on DOT and other standard classifications, and the names of organizations to call for additional product information.[7]

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[5] Association of Bay Area Governments, San Francisco, CA, *Hazardous Spill Prevention and Response Plan* (Washington, DC: U.S. Department of Transportation, Research and Special Programs Administration, 1983).

[6] National Conference of State Legislatures, op. cit.

Not all communities give first priority to inventory of hazardous materials at fixed facilities. For example, Niagara County, New York, a rural county traversed by an Interstate highway, centered attention first on a survey of commodities transported through the county. New Orleans initially concentrated on coordinating and improving existing procedures for emergency response.[8] However, the city has now turned attention to creating an inventory that will eventually be computerized by census tract and include all fixed storage facilities. In every city, gasoline is the most commonly stored hazardous material, and the New Orleans planning staff began by mapping underground tanks, on the assumption that this relatively limited inventory effort would ease the task of locating all gasoline stations. However, a number of substances other than gasoline are stored underground, making this effort a much more extensive and complicated task than anticipated.

State Inventory Studies

Massachusetts, also a DOT demonstration project participant, is one of the few States that has completed a fixed facilities inventory. For each of the State's 14 fire districts, State analysts used manufacturing directories to locate the firms with more than 100 employees that used or produced hazardous materials.[9]

ACETYL
WATER PUMP
OXYGEN
AVIA

Photo credit: Research and Special Programs Administration, DOT

Some common hazardous materials are typically transported in compressed gas cylinders.

In March 1983, the State of New Jersey passed a law requiring every firm manufacturing or handling hazardous substances to file a completed survey form with the State Department of Health and the county or local health, fire, and police departments. This information effectively provides a facilities inventory.

The State of Maryland has created a computerized registry of all toxic and carcinogenic substances stored at fixed sites. The State Department of Health and Mental Hygiene began gathering the data in 1979 with funds from a U.S. Environmental Protection Agency (EPA) grant. Currently, the registry contains inventories of more than 400 industrial users of toxic or carcinogenic substances. The data gathered comprise detailed information on 54 target chemicals selected by the department, including the maximum quantities stored and how they are transported. In the first data collection effort, the survey questionnaires returned were too incomplete to be useful. To obtain reliable data, staff members visited companies, spending as long as 2 days at each to assist them in completing the form. Data are updated annually, and personal visits are now usually necessary only for new firms. The staff estimates that the development of the computerized registry system cost over $400,000, not counting software development, which was paid for by the EPA grant, and annual operating costs. In addition to monitoring the quantities and types of chemicals being manufactured, stored, and transported in the State, the registry is also used to cross-reference health and environmental information with chemical sites and activity.[10]

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[7] Puget Sound Council of Governments, op. cit.

[8] City of New Orleans, *Hazardous Materials Accident Prevention and Emergency Response Program* (Washington, DC: U.S. Department of Transportation, Research and Special Programs Administration, 1983), p. 10.

[9] Energy Resources, Inc., *Phase I: Determine the Nature and Scope of Hazardous Materials Transportation in the Massachusetts Region, Vol. I* (Cambridge, MA: U.S. Department of Transportation, 1982), p. 4-36.

Community Support

The success of inventory efforts depends on the cooperation of public agencies, such as the fire and police departments, and private groups, such as chemical manufacturers, shippers, and carriers. Local advisory committees can be instrumental in obtaining such cooperation. Committees, appointed by elected officials, are usually multidisciplinary and composed of representatives from first response agencies, local industry, local and interstate carriers, and of public officials, educators, experts in hazardous materials, and environmentalists. Manufacturing and carrier representatives on a committee can advise researchers on how to approach local industry, recommend the project to their associates, and help assess the validity of data collected.

Although private sector support has at times been problematical, recent actions by the Chemical Manufacturers Association (CMA) indicate an increased interest by the chemical industry in cooperating with State and local planning efforts. In April 1985, CMA announced an industry-wide program designed to make chemical industry expertise available to local agencies, including furnishing planning groups with company safety data sheets on commodities manufactured and stored in the community.[11]

Right-To-Know

Inventories and surveys of facilities are effective ways to obtain data on the types and amount of hazardous materials present in a community or region. However, concerns about protecting trade secrets or other information considered to be proprietary (e.g., health or exposure data) have made some manufacturers unwilling to comply with requests for information. In response, many States and municipalities have enacted legislation, commonly referred to as "right-to-know" laws, that requires the release of information on the hazards associated with chemicals produced or used in a given facility. The majority of State right-to-know laws address both

Table 4-1.—State Right-to-Know Laws, 1985

State	Community provisions	Worker provisions
Alabama	....	X
Alaska	....	X
Arizona	....	....
Arkansas	....	X
California	....	X
Colorado	....	....
Connecticut	X	X
Delaware	X	X
Florida	X	X
Georgia	....	....
Hawaii	....	....
Idaho	....	....
Illinois	X	X
Indiana	....	....
Iowa	X	X
Kansas	....	....
Kentucky	....	....
Louisiana	X	X
Maine	X	X
Maryland	X	X
Massachusetts	X	X
Michigan	....	X
Minnesota	....	X
Mississippi	....	....
Missouri	X	....
Montana	X	X
Nebraska	....	....
Nevada	....	....
New Hampshire	X	X
New Jersey	X	X
New Mexico	....	....
New York[a]	....	X
North Carolina	X	X
North Dakota	X	X
Ohio	....	....
Oklahoma	....	....
Oregon	X	X
Pennsylvania	X	X
Rhode Island	X	X
South Carolina	....	....
South Dakota	....	....
Tennessee	X	X
Texas	X	X
Utah	....	....
Vermont	X	X
Virginia	....	....
Washington	X	X
West Virginia	X	X
Wisconsin	....	X
Wyoming	....	....

[a] Although New York has not passed community right-to-know regulations, in December 1983, Governor Cuomo issued an executive order requiring the Department of Environmental Conservation to inventory all toxic chemicals used, stored, or disposed of in the State.

SOURCES: National Conference of State Legislatures, "State Hazardous Materials Policy: Issues Raised by the Bhopal Incident," *State Legislative Report*, vol. 10, No. 1, January 1985; personal communication with Janis Adkins (ed.), *Right-To-Know News* (Washington, DC: Thompson Publishing Group, Oct. 22, 1985); and Department of Occupational Safety, Health, and Social Security of AFL-CIO, list of State right-to-know laws.

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[10] Max Eisenberg, Environmental Program, Maryland Department of Health and Mental Hygiene, personal communication with OTA staff, March 1985.

[11] Chemical Manufacturers Association, press release, Washington, DC, April 1985.

community and employee access to information about workplace hazards. Table 4-1 lists the States that have passed such laws. Increasing numbers of local governments are also enacting their own right-to-know statutes.

The provisions of these laws are not uniform, either in terms of the obligations placed on industry or in terms of the types of hazardous materials covered. States have also taken different approaches to exemptions according to business size or quantities of material involved and the extent to which firms may protect trade secrets.

The requirements of right-to-know laws most relevant to hazardous materials planning and emergency response include providing public access to information on hazardous materials present in a State or locality, conducting inventories or surveys, establishing recordkeeping and exposure reporting systems, and complying with container labeling regulations for workplaces. Other requirements do not pertain directly to hazardous materials planning or emergency response but to worker protection (e.g., training and certification programs, posting of warning signs and notices, provision of protective equipment, and employee rights to refuse to work under certain conditions).

In 1983, the Occupational Safety and Health Administration (OSHA) established a national hazard communication standard for employees in the manufacturing sector.[12] One part of this standard requires chemical manufacturers and importers to prepare a Material Safety Data Sheet (MSDS) for all hazardous chemicals produced or imported. Employers covered by the OSHA standard must have an MSDS for each hazardous chemical they use. Moreover, some States require that copies of the MSDS also be submitted to a State agency or local fire chief as part of their community right-to-know programs.

The OSHA standard is intended to preempt State right-to-know laws for workers, but it does not apply to right-to-know laws pertaining to disclosure of information to State and local planning agencies concerned with emergency preparedness and response. Pending judicial and congressional actions on the scope of the OSHA standard may have an effect on existing State and local provisions and on the establishment of national community right-to-know requirements.

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[12] 29 CFR 1910.

TRANSPORTATION STUDIES

In addition to fixed facility inventories, State and local governments have tapped a variety of public and private sources to collect data on truck, rail, air, and water transportation. Small towns and rural counties are particularly interested in transportation data because they see their greatest risk as a hazardous materials accident on an Interstate highway or railroad line passing through their jurisdiction. The type and quantity of hazardous materials carried by each mode and the principal routes used comprise the information most frequently collected for planning, risk analyses, routing decisions, and emergency response preparation. Because the data-gathering problems are different for each mode, highway, rail, air, and water transport are discussed separately and divided into local/regional and State studies.

Truck Studies—Local/Regional

DOT demonstrations and other projects reviewed by OTA put high priority on information about highway transport of hazardous materials because trucks far outnumber other types of hazardous materials carriers, carry the largest share of the hazardous materials shipments, and are involved in the greatest number of incidents. At the national level, however, little detailed information is available about hazardous materials movement by truck. Even the U.S. Census of Transportation, the most commonly used source of statistical information about highway transportation, does not contain enough detail to isolate hazardous commodities from other materials carried by truck.

Because of the lack of a central database on commodity flow, State and local planners have had to devise special means to collect data on highway transport of hazardous materials. The primary methods are questionnaires, visual surveys, and inspections. Several jurisdictions have sent out questionnaires to shippers, carriers, and manufacturers requesting information about hazardous materials shipments and the routes most frequently used.

Analysts in the Puget Sound Region, using questionnaire responses, truck route locations, and other information provided by local governmental departments, mapped the routes by which 85 target commodities moved within and through the region. The results of the research were useful, but the process was time-consuming and complex. Many firms did not answer the parts of the questionnaire concerning routes most frequently used, and planners had to make assumptions and later verify them by a visual check of truck movements. This involved recording placarded trucks according to commodity type at several strategic locations over a 17-day period.

Memphis used a questionnaire to gather data from local shippers and manufacturers, but only 28 out of 68 firms responded to the initial request for commodity flow information.[13] City officials believe that some respondents reported low volumes of hazardous materials, especially petroleum products, and State Highway Department tax records showed that the truckers had substantially underreported the flammables category on the questionnaire. In a survey conducted recently of manufacturers and transporters of hazardous materials in the New York City and New Jersey area, only 20 percent of those solicited returned completed questionnaires. This response, however, was considered high, since gathering and supplying the requested information was time-consuming, and most firms do not normally record production and shipping information according to hazard class or routing patterns.[14]

Other localities, without the time or resources for questionnaires, have resorted to visual surveys of trucks along major highways. Checkpoints, usually at weigh stations, are set up, and government employees or students count the placarded trucks passing through, recording the commodity class of each shipment. This type of survey was done in the San Francisco Bay area and in Indianapolis.

Truck Studies—State

Several States have successfully conducted surveys of the volume and types of hazardous materials carried by truck. In many cases, the States have had the resources and the authority to combine a visual survey with an inspection and driver interview. The earliest full-scale study was carried out in 1977 to 1978 by the Virginia Department of Transportation Safety as part of a multimodal analysis of hazardous materials transportation. During July and August 1977, all trucks passing 38 survey points on Interstate and primary roads were stopped by State or local police. Shipping papers were inspected, and the drivers were interviewed on the types of materials carried, origin and destination of the trip, and the sequence of routes taken. Officers also checked to see if the placarding was correct and classified the carrier as company-owned, independent, common carrier, or personal vehicle. The study findings provided Virginia officials with a current database on commodity flow and a good measure of the level of compliance with existing Federal and State regulations. The survey found that 13 percent of the trucks carried hazardous materials, of which 76 percent was flammable, combustible, or corrosive liquid. Petroleum products were the most common cargoes.[15]

Virginia conducted a followup survey between April and December 1978, using nine survey points located at weigh stations along Interstate routes. Researchers found that, by reducing the number of survey points, the costs of the study were substantially reduced, and the data yield per man-hour increased.

The findings of the survey showed a drop in the percentage of trucks carrying hazardous materials, from 13 percent in 1977 to 7 percent in 1978. It is not clear whether this drop was related to the decrease in checkpoints. The total quantity of hazardous cargoes did not decrease similarly. The average load per truck increased from 8.6 tons in 1977 to 12.9 tons in 1978. The researchers could not explain the variation between 1977 and 1978 in volume and load per vehicle. The study has not been updated, so the question remains unanswered. The heaviest hazardous materials traffic was on Interstate highways in and around cities, because urban areas are the principal origins and destinations of petroleum products. The number of placarding violations found by inspectors increased from 34 percent in 1977 to 55 percent in 1978.

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[13] City of Memphis Division of Fire Services, *Hazardous Materials Task Force Final Report* (Memphis, TN: 1981), p. 24.

[14] Raymond Scanlon, "A Regional Study on Hazardous Materials Transportation," draft report, Port Authority of New York, 1983, p. 15.

[15] J.W. Schmidt and D.L. Price, Virginia Polytechnic Institute, *Hazardous Materials Transportation in Virginia* (Richmond, VA: Virginia Department of Transportation Safety, 1980), p. XII.

According to one Virginia official, the State hopes to develop trained response teams for high-risk areas.[16] In the meantime a number of localities in Virginia have developed their own emergency response training plans. For example, Newport News, Virginia, has instituted hazardous materials Level I, II, and III certification programs.[17]

Several States, including Maryland, Illinois, South Dakota, and Arizona, have analyzed hazardous materials transportation as part of the SHMED program, which allowed assessments of the volume and nature of hazardous materials traffic. Over a 1-year period from October 1981 to September 1982, Washington State conducted a truck study, surveying the amounts of hazardous materials moving through the State and the type of carrier used. The study found that approximately 400 million tons, 175 million gallons, and 17 million cubic feet of hazardous materials moved annually through the State.

The Washington State methodology was similar to that of the Virginia study. The State Utilities and Transportation Commission set up checkpoints at 11 locations on major highways. All trucks were stopped and checked for 4-hour periods twice a month. The checks included an inspection of shipping papers and an interview with the driver about cargo, quantity carried, origin, destination, and type of carrier. The data were tabulated and sorted using the Automated Hazardous Materials Surveillance Program, a computer program designed for the study that can sort survey data according to date, location, commodity, and truck type and cross-check it with accident and violation data. Researchers found that although independent truckers carry 50 percent of the cargo, they are involved in 75 percent of the accidents.[18]

In 1982 and 1983, the South Dakota Department of Public Safety surveyed drivers and inspected approximately 340,000 trucks at highway checkpoints. Less than 1 percent of the trucks carried hazardous materials. The most common hazardous materials cargos were flammable liquids, explosives, corrosives, and flammable gases. The two Interstate highways passing through South Dakota were used for at least part of the trip by 90 percent of all hazardous materials shipments. The survey found that 55 percent of the hazardous materials shipped were intrastate, primarily flammable liquids and gases. These findings are consistent with the results of other studies. In addition, questionnaires were sent to a 10-percent sample of all carriers and to all shippers located in South Dakota. Approximately one-half responded. The results generally substantiated the highway inspection findings concerning route used, load size, and predominant type of cargo. Most intrastate shipments were local deliveries of 25 miles or less, usually originating in one of the larger cities. Although most deliveries were local, carriers indicated that their trucks spent as much as 40 percent of their time on Interstate highways.[19]

OTA research indicates that even when State transportation data collection programs are in place, cities within the State are not aware of this data resource and consequently do not make use of it.

Rail Studies—Local/Regional

Data collection on bulk rail shipments of hazardous materials can be extremely important to many cities, particularly rail distribution centers such as Memphis and Indianapolis, where data are needed for emergency planning and response purposes. Information on commodities transported, measured by rail carloads, is generally available on request from the major railroads, most of which have computerized cargo records. Computer information indicating the location of hazardous materials cars in the train and instructions on emergency response procedures is available on the train as well as through railroad offices. Conrail can provide detailed print-outs listing the type and quantities of hazardous materials carried on each section of the line. For example, in Indianapolis, Conrail provided planners with the number of rail cars carrying specific types of hazardous materials that originated and terminated in the city's three major rail yards.[20] In communities served by other railroads, the availability and detail of the data depend on the extent to which the line is computerized. In addition, the Association of American Railroads has compiled a list of the 138 chemicals most frequently carried by the railroads. It has developed detailed fact sheets for the commodities that are incorporated into computerized train information and waybills.[21]

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[16] Steve Gainor, Virginia State Emergency Management Agency, personal interview with OTA staff, July 1985.

[17] T.S. Walls, Fire Chief, Newport News, VA, personal communication, Nov. 1, 1985.

[18] U.S. Department of Transportation, Materials Transportation Bureau, *SHMED Program Workshop Proceedings, Salt Lake City, Utah, 1983* (Washington, DC: 1983), p. 206.

[19] Ibid., p. 186.

Memphis has produced a detailed profile of hazardous materials flows from data provided by the six railroads serving the city. Even though local planners were aware that a large volume of hazardous materials was handled by railroads in Memphis, the daily average of 150 rail cars carrying a total of 10,000 tons surprised them.[22] In the Indianapolis and Memphis studies, the mix of commodities shipped by rail from local firms was found to be the same as the national mix carried by all railroads, probably because both cities are major rail transfer points or chemical distribution centers.

Rail Studies—State

Only a few statewide studies of rail transportation of hazardous materials have been conducted. Massachusetts, as part of the research phase of a 1981 planning project, inventoried all the major rail lines in the State and obtained information on the types and quantities—in carloads—of hazardous materials shipped by three of the four largest railroads. Researchers concluded that relatively small amounts of hazardous materials were moved by rail in Massachusetts. In 1980, for instance, Conrail transported less than 1,700 carloads of hazardous materials in the Commonwealth. The study pointed out that most of the interstate and intrastate point-to-point rail line distances in Massachusetts are relatively short, making truck service very competitive.

Virginia, as part of a multimodal study in 1977 to 1978, collected data from the 10 railroads serving the State. The railroads provided waybill samples for subsections of each line. With this information, analysts estimated the number of cars per day carrying hazardous materials, the tons of hazardous materials carried per day, and the number of trains containing hazardous materials cars. In most cases, the class of the hazardous material was identified, and the data tabulated by DOT hazard class. When waybill information was not available, researchers had great difficulty gathering reliable data.[23] The study findings showed that corrosives accounted for almost half the volume of hazardous materials transported by rail (or approximately 195 tons per day), followed by flammable liquids with 51 tons per day, and nonflammable compressed gas with 43 tons per day. Corrosive materials and flammable liquids, primarily petroleum products, accounted for 58 percent of the total hazardous materials shipped by rail and 52 percent of all hazardous materials shipped by truck. The heaviest rail flow of hazardous cargo was in and around cities, a reflection of the demand for petroleum products in urban areas.

The State of Oregon requires annual summaries by milepost segment of all rail shipments of Class A explosives and poisons. These data are used for emergency response planning.

Air Transportation Studies

The transportation of hazardous materials by air is controlled by the Federal Aviation Administration's (FAA) Civil Security Division. Since hazardous shipments account for less than 3 percent of total hazardous materials tonnage moved nationally and since shipments are generally small, State and local governments do not appear to be particularly concerned about air transport. At the New Orleans, Memphis, and Boston airports, for example, FAA conducted surveys of the types and quantities of hazardous materials shipments and provided local planners with the data. To augment FAA data, researchers in at least two DOT demonstration studies obtained data on shipment characteristics for the air freight carriers. Local planners do not have access to information on hazardous materials carried by military aircraft.

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[20] City of Indianapolis, IN, *Demonstration Project to Develop a Hazardous Materials Accident Prevention and Emergency Response Plan* (Washington, DC: U.S. Department of Transportation, 1983), p. 36.

[21] Patrick J. Student (ed.), *Emergency Handling of Hazardous Materials in Surface Transportation* (Washington, DC: Bureau of Explosives, Association of American Railroads, 1981).

[22] National Conference of State Legislatures, op. cit.

[23] Schmidt and Price, op. cit., pp. 113-115.

Water Transportation Studies

Ports play an important role in hazardous materials commerce. For example, 4.5 million tons of hazardous materials pass through the Port of Seattle each year—about 27 percent of the total cargo handled. Over half of the Nation's chemicals move through the Port of Houston. Local planners rely on studies by the U.S. Corps of Engineers as their primary data source. The corps compiles the type and quantities of commodities transported into and through all major navigable waterways and harbors in the United States. The corps provided Massachusetts researchers with the annual tonnage by commodity group for 1978 for both the main Boston Harbor and the nearby New Bedford Harbor. However, the data classification system used by the corps does not always identify specific commodities. For instance, the "basic chemicals" category contains some nonhazardous materials; this leads to overestimates of the actual amounts of hazardous materials. However, none of the States or cities reviewed by OTA found this problem sufficient reason to conduct a separate or additional study. Two port cities, Seattle and Boston, supplemented the corps data with information on tonnage of commodities available from local regulatory agencies and the U.S. Coast Guard.

Federal Data on Shipment of Radioactive Materials and Wastes

In 1973 to 1975 and 1977 to 1981, two series of studies involving a number of States were conducted jointly by the Nuclear Regulatory Commission (NRC) and DOT for the purpose of collecting information on the transportation of low-level radioactive materials. These studies were the foundation for what became the SHMED program to help develop State prevention and enforcement capability. Data were gathered on low-level radioactive waste sites; shipments by highway, air, and water, and the history of accidents and incidents. Findings were used to determine gaps in Federal regulatory programs and in Federal and State enforcement efforts. These studies, stimulated by State and local concerns over lack of adequate surveillance of shipments of low-level radioactive materials and wastes, effectively proved the advantages of and need for continued inspection and enforcement training and implementation at Federal and State levels.[24] Interest in enforcement of regulations governing radioactive materials led to broader Federal and State cooperative efforts on the general problem of prevention and emergency response planning for all types of hazardous materials.

RETURN TO OAK RIDGE NATIONAL LAB.
OAK RIDGE, TENN. U. S. A.
RADIOACTIVE MATERIAL
WT. 76 LBS.
NO. 1-D-1
U. S. A.-DOT-7A
TYPE-A

Photo credit: Research and Special Programs Administration, DOT

Marking for radioactive materials, required by Federal regulations.

Data on movement for high-level radioactive materials and wastes, including spent fuel, are treated differently from other hazardous materials data—both legally and institutionally. DOT has primary responsibility for surveillance and monitoring of low-level radioactive materials and wastes, while DOT and NRC share regulatory and enforcement authority for high-level radioactive materials and wastes.

NRC requires licensees to provide advance notice for certain nuclear shipments to provide physical protection of special nuclear materials to prevent theft, diversion, or sabotage, and to notify NRC regional offices of impending special shipments of nuclear materials. These requirements, in effect since 1975, were expanded in 1979 to include spent nuclear fuel. In the NRC Reauthorization Act of 1980, Congress directed NRC to expand its shipment notification procedures to include State governments. In its rulemaking, NRC indicated that:

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[24] Steve N. Solomon, *State Surveillance of Radioactive Material Transportation*, NUREG-1015 (Washington, DC: U.S. Nuclear Regulatory Commission, Office of State Programs, 1984), p. 5.

> . . . the purpose of the rule is to provide States with information not otherwise available to them, which will enable them to contribute to the safety, security and ease of transport of shipments.[25]

While there is no central database available on the number of licensees, information can be extracted from two Federal databases to obtain an approximation of shipping activity for high-level commercial wastes and materials (excluding Department of Energy shipments). A study conducted by the Battelle Memorial Institute for DOT analyzed States' use of the information on transport shipments of spent nuclear fuel through their jurisdictions. Of the States surveyed, 14 out of 15 maintain a file of notifications. Five States pass the information on to other State agencies, two make subsequent notifications to other elements of the same agencies, and six subsequently notify officials at both the State and local levels. Two States make no further notification for security reasons.

The primary benefit of notification identified by almost all States surveyed was that awareness of impending shipments allowed them to take precautions and alert emergency response agencies. The Battelle report concluded that the notification system was working well under current NRC regulatory procedures; however, some caution was indicated about the adequacy of the notification systems if shipment levels increase as expected in the 1990s.

Notification Laws as Tools for Data Gathering

As part of the search for available and reliable data for hazardous materials planning, OTA examined State and local notification requirements as a potential source of information. The Battelle study, cited above, identified 136 State and local notification laws pertaining to hazardous materials transportation. The vast majority of these apply to trucks; a few apply to rail. Of the 136 regulations and ordinances, 62 apply statewide, 42 are local, and 32 apply to transportation facilities such as bridges, tunnels, turnpikes, and airports.[26] Notification requirements, as defined by the study, include prenotification by shippers and carriers, periodic summaries, and reports on individual shipments filed after a trip. Prenotification is required by 100 State and local regulations, 14 call for periodic reporting, and 22 concern individual trip reports. Local government regulations applying to transportation facilities almost universally require prenotification. Table 4-2 lists State and local notification laws and the types of hazardous materials covered.

The Battelle study found that State and local governments typically give two reasons for enacting notification requirements: to provide data for planning (including better routing and safety regulations), and to improve emergency response. Over two-thirds of the jurisdictions identified planning as an important objective of their laws, citing the need to gather information about the types and quantities of materials shipped through their jurisdictions and information on trip scheduling and routes frequently used. Many also indicated they require advance notification to alert response teams when a potentially hazardous shipment is due.

Although these regulations could be valuable means of gathering data, most produce little usable data because they apply to a very narrow range of materials or because they are not enforced. State and municipal governments have tended to regulate only one high-risk commodity, usually spent fuel or high-level radioactive wastes, although some also include other radioactive materials and low-level wastes. Only four States have laws requiring prenotification for other classes of hazardous materials. While data on radioactive materials are important, such shipments constitute such a small percentage of all hazardous materials traffic that prenotification for this one class provides only partial satisfaction of local needs. Recently, some communities have acted to broaden notification requirements to include other types of hazardous materials.

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[25] Battelle Memorial Research Laboratories, Battelle Human Affairs Research Center, *Assessment of State and Local Notification Requirements for Transportation of Radioactive and Other Hazardous Materials* (Columbus, OH: Jan. 11, 1985), pp. 88-112.

[26] Ibid.

Table 4-2.—Commodities Covered by Notification Requirements, 1985

	Spent fuel and/or high-level waste	Other radioactive materials	Hazardous wastes	Other hazardous materials
State:				
Arkansas	...	...	X	X
California	X	...	...	...
Colorado	...	...	X	...
Connecticut	X	X	...	...
Florida	X	X	...	...
Georgia	X	X	X	X
Illinois	...	...	X	...
Louisiana	...	...	X	...
Maine	...	X	X	...
Massachusetts	X	...	X	...
Michigan	X	X	...	...
Mississippi	X	X	...	...
Nevada	X	X	...	...
New Hampshire	...	...	...	X
New Jersey	X	X	...	...
New Mexico	X	X	...	...
North Carolina	X	...	...	...
Ohio	X	X	...	...
Oregon	...	...	...	X
Rhode Island	X	X	X	...
South Carolina	X	X	...	...
Tennessee	X	...	...	...
Vermont	X	X	...	...
Virginia	X	X	X	...
Total	17	14	9	4
Local:				
Chickaswa, AL	...	...	X	...
Phoenix, AZ	...	...	X	X
Tempe, AZ	...	...	...	X
Tucson, AZ	X	X	...	...
Morro Bay, CA	X	X	...	...
New London, CT	X	X	...	...
Garden City, GA	B	X	...	...
Lawrence, KS	B	X	...	...
Covington, KY	X	X	X	X
Kenner, LA	...	...	...	X
Kent County, MD	X	...	...	...
Prince George's County, MD	X	X	...	...
Newton, MA	X	...	...	...
Ypsilanti, MI	B	X	...	...
Missouli, MT	X	X	...	...
Binghamton, NY	X	...	...	...
Geneva, NY	X	X	...	...
Ithaca, NY	X	X	...	...
Jefferson County, NY	X	X	...	X
New York, NY	X	X	...	...
Rockland County, NY	X	X	...	...
St. Lawrence County, NY	X	X	...	...
Syracuse, NY	X	X	...	...
Tompkins County, NY	X	X	...	...
Vestal, NY	X	X	...	...
Yates County, NY	X	...	...	...
Facilities:				
Golden Gate Bridge, CA	X	X	...	...
Delaware Memorial Bridge, DE	X	X	X	X
Francis Scott Key Bridge, MD	X	X	...	X
Harry W. Nice Memorial Bridge, MD	X	X	...	X
John F. Kennedy Memorial Highway, MD	X	X	...	X
Susquehanna River Bridge, MD	X	X	...	X

Table 4-2.—Commodities Covered by Notification Requirements—Continued

	Spent fuel and/or high-level waste	Other radioactive materials	Hazardous wastes	Other hazardous materials
William Preston Lane, Jr. Memorial Bridge, MD	X	X	....	X
Massachusetts Turnpike Authority, MA	X	X	....	....
Blue Water Bridge, MI	B	B	....	X
Mackinac Bridge, MI	X	X	....	X
Garden State Parkway, NJ	X	X	....	....
Newark International Airport, NJ	X	X	....	X
New Jersey Turnpike, NJ	X	X	....	X
Bayonne Bridge, NY	X	X	....	X
George Washington Bridge:				
Expressway, NY	B	X	....	....
Lower Level, NY	B	X	....	....
Upper Level, NY	X	X	....	X
Geothals Bridge, NY	X	X	....	X
Holland Tunnel, NY	B	X	....	....
Kennedy International Airport, NY	X	X	....	X
La Guardia Airport, NY	X	X	....	X
Lincoln Tunnel, NY	B	X	....	....

NOTE: X= existing; B= bans on transportation.

SOURCE: Battelle Human Affairs Research Center.

Lack of enforcement of notification regulations means that there is little reason for shippers and carriers to comply, and as result, little information is gathered. Several local agencies were found to be unaware of the notification laws they were supposed to enforce. Some community officials reported that they have never received a notification even though it is required by local ordinance. The Battelle study observed that, while there are instances of conscientious enforcement and data collection, many local agencies charged with enforcing regulations on prenotification give the task relatively low priority. Often when information is collected, it is simply filed and not used for planning purposes.

Florida and Massachusetts are among the exceptions to these conclusions. Florida checks with disposal facilities to identify carriers failing to comply with radioactive waste notification requirements. Letters are sent to shippers summarizing violations, and monthly reports are sent to the nuclear utilities in Florida summarizing recent shipments. According to State officials, the radioactive waste database is useful in long-range planning, and they plan to identify different types of waste streams and use the information to improve transportation, treatment, and disposal policies. Massachusetts has six notification regulations governing shipments of hazardous wastes: three require individual trip reports, two require periodic reports, and one requires prenotification. The information gathered is used in a variety of ways, including verifying delivery of the waste and alerting local health agencies and emergency response teams. Carriers' monthly reports are stored in a computerized file and could be referred to during compliance investigations or matched with manifests submitted by shippers, although this procedure has not yet been put into practice.

HAZARDS ASSESSMENT STUDIES

State and local planning and emergency preparedness can be improved by studies assessing the chances of an accident occurring and identifying the most likely locations. Such assessments are important for contingency planning, for practical decisions about locating equipment and allocating manpower, and for developing routing plans.

A few jurisdictions have used sophisticated mathematical techniques of risk analysis to estimate the probability of an incident and its severity. Most communities, however, find it adequate to map the areas where the risk of a hazardous materials incident is highest or where there would be the greatest public danger or the most damage. Data for this type of study can be assembled either from a fixed facility inventory or a transportation study. Much useful information is also available from public records routinely kept for other purposes by State and local public works, transportation, environmental, and planning departments. Normally a hazard assessment requires the following kinds of information:

- transportation network maps and descriptions;
- highways and streets used by hazardous materials carriers;
- tunnels, bridges, and rail crossings;
- railroad yards and truck terminals;
- highway accident data;
- locations of past hazardous materials incidents and materials involved;
- concentrations of hazardous materials manufacturing or storage sites;
- areas of high population density;
- location of schools, hospitals, and other especially vulnerable groups; and
- water supply and sewer facilities.

More advanced assessments might also include special analyses of the types and quantities of hazardous materials transported through the community and the location of emergency response teams and equipment.

The San Francisco Bay area study drew on information of this sort to determine the risks in each of the nine participating counties. The analysis included a narrative description, supplemented by maps of each county. In rural Niagara County, planners found it adequate to use just three factors to assess the probability and impact of highway hazardous materials accidents. Analysts obtained accident data for trucks from the State Police and information on environmentally sensitive areas from the county and combined those with data on the volume of hazardous materials flow on the major highways obtained from a special transportation survey conducted as part of the study. The analysis showed that areas along the Interstate highway had the highest risk.[27]

Some localities have used more complex mathematical-risk models. As part of the Puget Sound Plan, consultants combined data from transportation inventories and data on geographic characteristics, population density, and environmental conditions in the region with a mathematical model of hazardous materials behavior in order to predict the incidence and impacts of hazardous materials spills. The analysts also used a fault-tree technique for various types of transportation equipment to estimate probabilities of releases actually occurring as the result of an accident. The results of the Puget Sound study were used in making routing recommendations for trucks carrying liquefied petroleum gas.[28]

There have also been some notable State hazard assessments. Massachusetts and Virginia used data obtained in the inventory studies described earlier to evaluate risk areas in their States. Massachusetts ranked the risks as high, medium, or low for each of the 14 fire districts in the State. Among the factors considered were employment in firms producing or storing hazardous materials, proximity to a port facility, and the volume of truck traffic on the major highways. Virginia identified the locations where the risk was highest for both train and truck incidents. For rail, the risks were calculated for an incident on the main track, at highway crossings, and in yards. The analysis indicated that the variables with the highest correlation to accidents were the volume of hazardous materials being transported, the curve of the track, the speed limit for freight trains, and the grade of the track.

The most difficult data-gathering problem in State and local studies has been obtaining reliable information on past hazardous materials incidents. Most fire departments do not keep separate records of hazardous materials incidents, although fire departments in some large metropolitan areas are beginning to develop special hazardous materials report forms for use in internal planning. State and local planners usually must rely on outside sources, some of which may be unreliable or contradictory. The experience of the Bay Area planners illustrates the difficulty of collecting data on spills: of 16 Federal, State, regional, and local sources contacted, only 9 could provide data on past incidents within the timeframe of the demonstration study. Moreover, these sources did not have a common standardized format, and sources reporting the same incident often varied considerably. The U.S. Coast Guard Pollution Incident Reporting System for spills on navigable water was found to be particularly useful since it contained detailed and comprehensive reporting of date, time, location, material, quantity, source, cause, and anticipated cleanup costs.

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[27] Waste Resource Associates for the Niagara County Legislature, *Demonstration Project to Develop a Hazardous Materials Accident Prevention and Emergency Response Plan* (Washington, DC: U.S. Department of Transportation, 1983), pp. 3-4.

[28] Battelle Memorial Research Laboratories, *Hazardous Materials Transportation Risks in the Puget Sound Region* (Washington, DC: U.S. Department of Transportation, 1981), p. 1-1.

The DOT Office of Hazardous Materials Transportation (OHMT) maintains a file of all reported incidents involving spills of hazardous materials in interstate commerce, and State and local agencies have access to this information. Because OHMT's reporting rules do not, in most cases, require reports on spills in intrastate commerce, many truck accidents of considerable local significance do not show up in OHMT's file. It is the responsibility of each transportation company involved in an incident involving a spill of hazardous materials, as defined by Federal regulations, to report it to OHMT. Currently no effective enforcement exists for this Federal regulation, so, in effect, accident reporting is voluntary. In addition to the OHMT incident file, the FHWA Bureau of Motor Carrier Safety maintains a truck registry list and monitors the accident record of trucking companies as part of its inspection program. It also uses this registry to report to the Interstate Commerce Commission on the safety record of carriers applying for an additional license.

State and local researchers trying to analyze accident records for their area studies report that the OHMT incident file is not useful to them, however. A New York City study found that when 30 major spills widely reported in the press were tracked through the OHMT records, only 12 were found. The 18 unreported incidents, according to press reports, had resulted in 18 deaths, 9 persons missing, and 187 injured.[29] Even if a State keeps complete accident records, local staffs are usually unaware of this resource, and many communities find their own accident data incomplete. Niagara County, for example, had too few recorded hazardous materials transportation accidents to draw significant inferences. On the other hand, Memphis planners found a wealth of information in the 972 incidents recorded by the city fire department in a single year.

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[29] Scanlon, op. cit., p. 48.

FINDINGS

- **Financial assistance for data collection and planning activities is needed by many localities.** Potential sources of funds include Federal, State, and local government cooperative programs with industry, and registration or user fees.
- **Hazardous materials storage facility inventories provide important background for hazardous materials transportation planning, as well as data for response and prevention planning.** Data may be developed from questionnaire surveys, public records, and industrial directories. Questionnaires often require followup and are most effective when sent out under the auspices of public agencies such as fire departments.
- **Local advisory committees can be very helpful in identifying the hazardous substances to be inventoried and in soliciting the cooperation of the private business sector.**
- **Data on commodity flow is needed by State and local governments for hazard assessments and planning.** Databases pertaining to commodity flow are kept by various Federal agencies, but the agencies do not use the same commodity identification codes, and the databases are not interactive. Consequently, the data are not useful to State and local governments.
- **Because of the absence of a reliable national hazardous materials transportation database, State and local governments have undertaken their own studies to determine what is transported near, within, and through their communities.**
  - —Successful State surveys combine truck and cargo inspection with driver interviews. Visual counts of placarded trucks have several drawbacks, because many trucks are placarded incorrectly or not at all.

—Rail commodity flow data are increasingly available as the industry computerizes.

—Data on types and quantities of hazardous materials transported by air and water do not appear to be major concerns for States and local communities.

- **A reliable, comprehensive Federal accident record system is needed. Current Federal efforts are too fragmented to be useful to State and local agencies.**
- **Department of Defense and Department of Energy shipments of explosives or radioactive materials are of concern to State and local governments, which understand the need for secrecy about such shipments, but want guarantees that Federal enforcement and emergency response efforts will be adequate when an accident occurs.**

Appendixes

Appendix A

State Authority for Hazardous Materials Transportation

Hazardous Materials Transportation: Regulatory, Enforcement, and Emergency Response*

Alabama
R—Public Service Commission
E—Public Service Commission
ER—Civil Defense Department

Alaska
R—Public Service Commission
E—Not specified
ER—Division of Emergency Services

Arizona
R—Industrial Commission
E—Not specified
ER—Division of Emergency Services

Arkansas
R—Transportation Commission
E—Transportation Commission, State Police, State Highway Department
ER—Office of Emergency Services

California
R—Department of the California Highway Patrol
E—Highway Patrol
ER—Office of Emergency Services

Colorado
R—Public Service Commission
E—Not specified
ER—Office of Civil Defense

Connecticut
R—Public Safety Commission
E—Local fire marshal of each town, city, or borough
ER—Office of Civil Preparedness

Radioactive Materials Transportation: Regulatory, Enforcement, and Emergency Response

Alabama
R—State Board of Health
E—Inspectors
ER—Civil Defense Department

Alaska
R—Department of Health and Social Services
E—Not specified
ER—Division of Emergency Services

Arizona
R—Corporation Commission, Motor Transport Division
E—Not specified
ER—Division of Emergency Services

Arkansas
R—Transportation Commission
E—State Police, State Highway Department
ER—Office of Emergency Services

California
R—Department of Health Services, Radiological Health Section, Department of Transportation, California Highway Patrol, Motor Carrier Division, California Energy Commission
E—Health Department officers, Division of Industrial Safety, Public Service Commission, any traffic officer
ER—Office of Emergency Services

Colorado
R—Department of Public Health, Public Utilities Commission
E—Inspectors, State Patrol officers
ER—Office of Civil Defense

Connecticut
R—Department of Transportation; Environmental Protection, Radiation Control; Public Safety
E—Inspection procedure developed by Commissioner of Public Safety, Radiation Control, State Police, Public Safety
ER—Office of Civil Preparedness

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[1] National Conference of State Legislatures, "Hazardous Materials Transportation, A Legislator's Guide," 1983, p. 95, and Association of American Railroads, "Nuclear Emergency Response Planning for Railroads," November 1984, p. F-3.

*R = Regulatory; E = Enforcement; ER = Emergency Response.

Delaware
R—Commission on Transportation of Hazardous Materials
E—Not specified
ER—Division of Emergency Planning and Operations

Florida
R—Department of Insurance
E—State Fire Marshal
ER—Bureau of Disaster Preparedness

Georgia
R—Department of Transportation
E—Department of Transportation, any law enforcement officer
ER—Department of Civil Defense

Hawaii
R—Not specified
E—Not specified
ER—Office of Civil Defense

Idaho
R—Department of Transportation
E—Department of Transportation, police officers authorized in writing
ER—Military Division, ING

Illinois
R—Department of Transportation
E—Department of Transportation, law enforcement officers
ER—Emergency Services and Disaster Agency

Indiana
R—Public Service Commission
E—Not specified
ER—Department of Civil Defense and Emergency Management

Iowa
R—Department of Environmental Quality, State Fire Marshal, city governments, Commission on Public Safety
E—Department of Environmental Safety, State Fire Marshal
ER—Department of Public Defense

Kansas
R—Department of Transportation
E—Not specified
ER—Division of Emergency Preparedness

Delaware
R—Commission on Transportation of Hazardous Materials
E—Departments represented on Commission, State Police
ER—Division of Emergency Planning and Operations

Florida
R—Public Service Commission, Department of Health and Rehabilitative Services
E—Uniformed officers, Department of Health and Rehabilitative Services
ER—Bureau of Disaster Preparedness

Georgia
R—Department of Transportation
E—Department of Transportation, any law enforcement officer
ER—Department of Civil Defense

Hawaii
R—Not specified
E—Not specified
ER—Office of Civil Defense

Idaho
R—Public Utilities Commission, Department of Environmental and Community Services
E—Department of Transportation, State Police
ER—Military Division, ING

Illinois
R—Department of Transportation, Public Service Commissioner, Department of Nuclear Safety
E—State Police, weigh station officers
ER—Emergency Service and Disaster Agency

Indiana
R—Public Service Commission, Indiana Fall Bridge Commission, Board of Health, Radiological Health Section
E—State Police, weigh station officers
ER—Department of Civil Defense and Emergency Management

Iowa
R—Department of Environmental Quality, Department of Transportation
E—Uniformed enforcement personnel at weigh stations
ER—Department of Public Defense

Kansas
R—Department of Health and Environment
E—According to Nuclear Regulatory Commission agreement
ER—Division of Emergency Preparedness

Kentucky R—Not specified E—Not specified ER—Office of Disaster and Emergency Services	**Kentucky** R—Department of Human Resources, Radiation Control Branch E—Not specified ER—Office of Disaster and Emergency Services
Louisiana R—Department of Transportation E—Department of Transportation ER—Department of Public Safety	**Louisiana** R—Department of Natural Resources, Nuclear Energy Division, Department of Public Safety E—State Police ER—Department of Public Safety
Maine R—Not specified E—Not specified ER—Bureau of Civil Emergency Preparedness	**Maine** R—Department of Human Resources, Radiological Health E—Not specified ER—Bureau of Civil Emergency Preparedness
Maryland R—Department of Transportation Authority E—Not specified ER—Civil Defense and Disaster Preparedness Agency	**Maryland** R—Department of Transportation, Vehicle Administration; Department of Health and Mental Hygiene E—Toxic Substance Control Inspector—personnel accompany State Police ER—Civil Defense and Disaster Preparedness Agency
Massachusetts R—Department of Public Utilities E—Not specified ER—Division of Public Safety	**Massachusetts** R—Department of Public Works E—Can issue violation citations ER—Division of Public Safety
Michigan R—Fire Safety Board E—State Fire Marshal ER—Emergency Services Division	**Michigan** R—State Police; Fire Marshal Division; Department of Public Health, Radiation Division E—State Patrol, contract with U.S. Department of Transportation and Nuclear Regulatory Commission to identify and report violations ER—Emergency Services Division
Minnesota R—Department of Transportation E—Not specified ER—Division of Emergency Services	**Minnesota** R—Department of Transportation, Office of Rate and Regulation; Department of Health, Radiation Control Section E—Motor transportation representatives, U.S. Department of Transportation ER—Division of Emergency Services
Mississippi R—Department of Public Safety E—Not specified ER—Emergency Management Agency	**Mississippi** R—Public Service Commission; State Board of Health, Division of Radiation Protection E—U.S. Department of Transportation ER—Emergency Management Agency
Missouri R—Public Service Commission E—Not specified ER—Office of Civil Defense	**Missouri** R—Public Service Commission E—Inspectors—no enforcement capability ER—Office of Civil Defense

Montana
R—Division of Motor Vehicles
E—Not specified
ER—Department of Military Affairs

Nebraska
R—Public Service Commission
E—Not specified
ER—Civil Defense Agency

Nevada
R—Public Service Commission
E—Public Service Commission
ER—Division of Civil Defense and Disaster Preparedness

New Hampshire
R—Not specified
E—Not specified
ER—Civil Defense Agency

New Jersey
R—Department of Labor and Industry
E—Not specified
ER—State Police

New Mexico
R—Transportation Department
E—Not specified
ER—Office of Civil Defense

New York
R—Department of Transportation
E—Department of Transportation
ER—Not specified

Montana
R—Department of Health and Environmental Sciences, Public Service Commission
E—Inspectors who respond to accidents and report noncompliance to U.S. Department of Transportation, Highway Patrol, Gross Vehicle Weight Division inspectors
ER—Department of Military Affairs

Nebraska
R—Public Service Commission, Motor Transportation Department; Department of Roads; Department of Health, Division of Radiological Health
E—Inspectors, weigh station enforcement, emergency response only
ER—Civil Defense Agency

Nevada
R—Public Service Commission, Transportation Division, State Department of Human Resources
E—Inspectors, Beatty site inspectors
ER—Division of Civil Defense and Disaster Preparedness

New Hampshire
R—Department of Health and Welfare, Bureau of Environmental Health
E—State Police
ER—Civil Defense Agency

New Jersey
R—Department of Labor and Industry, Division of Workplace Standards; Department of Environmental Protection, Bureau of Radiation Protection
E—State Police
ER—State Police

New Mexico
R—Corporation Commission, Transportation Division, Department of Health and Environment
E—Weigh stations
ER—Office of Civil Defense

New York
R—Department of Environmental Conservation, Bureau of Hazardous Waste; Department of Transportation, Traffic and Safety Division
E—Department of Transportation, State Police, Federal Highway Authority

North Carolina
R—Public Utilities Commission
E—Public Utilities Commission
ER—Not specified

North Dakota
R—Public Service Commission
E—Not specified
ER—Disaster Emergency Services

Ohio
R—Department of Transportation
E—Not specified
ER—Disaster Services Agency

Oklahoma
R—Department of Public Safety
E—Not specified
ER—Civil Defense Agency

Oregon
R—Public Utilities Commission
E—Not specified
ER—Emergency Services Division

Pennsylvania
R—Hazardous Substances Transportation Board
E—Various
ER—Emergency Management Agency

Rhode Island
R—Consumer Council—hazardous materials packaged for consumer consumption
E—Not specified
ER—Defense Civil Preparedness Agency

North Carolina
R—North Carolina Utilities Commission, Department of Human Resources, Division of Facility Services, mobile inspectors and cooperation with Highway Patrol, Public Service Motor Carrier Division of Motor Vehicles
E—Commission officers, often accompanied by personnel from the Highway Patrol, License and Theft Section and from Radiation Health, mobile inspectors and cooperation with Public Service Motor Carrier Division of Motor Vehicles
ER—Not specified

North Dakota
R—Public Service Commission, Department of Health, Motor Vehicle Department
E—Highway Department and Patrol, emergency response
ER—Disaster Emergency Services

Ohio
R—Department of Health, Public Utilities Commission
E—Field officers
ER—Disaster Services Agency

Oklahoma
R—Department of Health
E—Emergency response organizations
ER—Civil Defense Agency

Oregon
R—Public Utilities Commission; Department of Human Resources, Radiation Control Section; Department of Energy
E—Inspectors; emergency response, backup for Public Service Commission
ER—Emergency Services Division

Pennsylvania
R—Department of Transportation, Hazardous Substances Transportation Board
E—State Police, Department of Revenue, Bureau of Motor Vehicles, Members of the Hazardous Substances Transportation Board
ER—Emergency Management Agency

Rhode Island
R—Department of Health, Division of Public Utilities, carriers
E—Coordinated with Division of Public Utilities, Radiation Control, Civil Defense, Transportation and Police
ER—Defense Civil Preparedness Agency

South Carolina
R—Not available
E—Not available
ER—Not specified

South Dakota
R—Department of Public Safety
E—Department of Public Safety
ER—Office of Civil Defense

Tennessee
R—Public Service Commission
E—Public Service Commission
ER—Not specified

Texas
R—Department of Public Safety
E—Not specified
ER—Division of Disaster Emergency Services

Utah
R—Department of Transportation
E—Not specified
ER—Division of Comprehensive Emergency Management

Vermont
R—Department of Transportation
E—Department of Transportation
ER—Civil Defense Division

Virginia
R—State Board of Health
E—State Police
ER—Office of Emergency and Energy Services

Washington
R—State Patrol
E—State Patrol
ER—Department of Emergency Services

South Carolina
R—Department of Health and Environmental Control, Public Service Commission, Transportation Division available
E—Barnwell site inspection, checkpoints, and random stops
ER—Not specified

South Dakota
R—Department of Health, Sanitation and Safety Program, Office of the Governor
E—Department of Public Safety, accompany U.S. Nuclear Regulatory Commission personnel on inspections
ER—Office of Civil Defense

Tennessee
R—Department of Public Health, Division of Radiological Health; Public Service Commission, Motor Carrier Division
E—Weigh station inspectors, inspectors
ER—Not specified

Texas
R—Department of Health; Department of Public Safety, Division of Disaster and Emergency Services
E—Radiation specialists on compliance staff, highway troopers
ER—Division of Disaster Emergency Services

Utah
R—Department of Transportation, Division of Safety
E—Highway and rail inspectors
ER—Division of Comprehensive Emergency Management

Vermont
R—Department of Health
E—State Police at weigh stations
ER—Civil Defense Division

Virginia
R—Department of Health, Bureau of Radiological Health
E—Shared responsibility of personnel from Emergency Services Office and Bureau of Radiological Health
ER—Office of Emergency and Energy Services

Washington
R—State Patrol, Department of Social and Health Services, Utilities and Transportation Commission
E—Inspectors
ER—Department of Emergency Services

West Virginia
R—Public Service Commission
E—Not specified
ER—Office of Emergency Services

Wisconsin
R—Public Service Commission
E—Not specified
ER—Division of Emergency Government

Wyoming
R—State Highway Commission
E—Not specified
ER—Disaster and Civil Defense Agency

West Virginia
R—Department of Health, Industrial Hygiene Division
E—Not specified
ER—Office of Emergency Services

Wisconsin
R—Transportation Commission, Tariff Division
E—Investigators, enforcement by Department of Transportation State Patrol Troopers
ER—Division of Emergency Government

Wyoming
R—Public Service Commission
E—Highway Patrol
ER—Disaster and Civil Defense Agency

Appendix B

Hazardous Materials Training Programs

This is not intended as a complete listing of all hazardous materials training offered by industry, professional associations, private firms, and universities; but rather a partial compilation of available training taken from three sources:

- *National Directory of Hazardous Materials Training Courses*, Association of Bay Area Governments, March 1985;
- John R. Cashman, *Hazardous Materials Emergencies: Response and Control* (Lancaster, PA: TECHNOMIC Publishing Co., 1983); and
- Doug Stancell, interim results of a U.S. Department of Transportation/Federal Emergency Management Agency survey on existing training courses on hazardous materials.

Industry

Ansel Fire Protection, One Stanton Street, Marinette, WI 54143 (715) 735-7411

Ashland Chemical Co., Jack Sweet, 5200 Blazer Memorial Highway, Dublin, OH 43017 (614) 889-3333

Burlington Northern Railroad, Safety and Rules Department, John Ogard, 9401 Indian Creek Parkway, P.O. Box 29136, Overland Park, KS 66201 (913) 661-4110

Celanese Fire Training Center, Dean of Extension Services, York Technical College, Rock Hill, SC 29730 (803) 327-3200

Conrail, M.C. Mitchell, 1528 Walnut St., 19th Floor, Philadelphia, PA 19102 (215) 893-6505

E.I. du Pont de Nemours & Co., Fabrics and Finishers Department, Applied Technology Division, Marshall Mill Building, Wilmington, DE 19898 (302) 992-3620

Federal Express, Department 373-012, George Truesdale, P.O. Box 727, Memphis, TN 38194 (800) 797-7752

Flying Tigers, P.O. Box 92935, T-257, Los Angeles International Airport, Los Angeles, CA 90009 (213) 646-7496

Illinois Central & Gulf Railroad Co., Carl D. Bossard, 233 N. Michigan Avenue, Chicago, IL 60601 (312) 565-1600

International Mineral & Chemical, Rick Rose, 421 E. Hawley Street, Mundelein, IL 60060 (312) 566-2600

J.T. Baker Chemical Co., Office of Safety Training, 222 Red School Lane, Phillipsburg, NJ 08865 (201) 454-2500

Mobay Chemical Corp., Agricultural Chemical Division, John E. Bash, P.O. Box 4913, Kansas City, MO 64120 (816) 242-2000

National Draeger, Inc., 101 Technology Drive, P.O. Box 120, Pittsburgh, PA 15230 (412) 787-8383

Norfolk & Western Railway Co., Hazardous Materials, Ronald M. Sharp, 8 N. Jefferson Street, Roanoke, VA 24042 (703) 981-5353

Seaboard Coast Line Industries, Hazardous Materials Training, Larry Taliaferro, 500 Water Street, Jacksonville, FL 32202 (904) 359-1529

Shell Oil Co., Transportation, Safety and Regulation, W.H. Owen, Jr., P.O. Box 2099, Houston, TX 77001 (713) 241-5546

Southern Railway System, J.J. O'Driscoll, 185 Spring Street, Atlanta, GA 30303 (404) 529-1917

Southern Pacific Transportation Co., One Market Plaza, San Francisco, CA 94105 (415) 541-1182

Stauffer Chemical Co., Adrian Casey, Nyala Farm Road, Westport, CT 06881 (203) 222-3000

Union Pacific Railroad, Environmental Control, C.J. Wright, 1416 Dodge Street, Omaha, NE 68179 (402) 271-3313

Associations

Academy of Advanced Traffic, 211 S. Broad Street, Philadelphia, PA 19107 (215) 981-9790

Air Freight Association, Steven Alterman, 1050 17th Street, N.W., Washington, DC 20036 (202) 293-1030

American Industrial Hygiene Association, 475 Wolfledges Parkway, Akron, OH 44311 (216) 762-7294

American Trucking Associations, Maintenance Council, Brent Grimes, 2200 Mill Road, Alexandria, VA 22314 (703) 838-1700

Association of American Railroads, Charles Keller, Hazardous Materials Systems, 50 F Street, N.W., Washington, DC 20001 (202) 639-2100

Association of Bay Area Governments, P.O. Box 2050, 101 8th Street, Oakland, CA 94604 (415) 464-7900

Chemical Manufacturers Association, Alma Howard, 2501 M Street, N.W., Washington, DC 20036 (202) 887-1100

Chlorine Institute, Michael E. Lyden, 70 W. 40th Street, New York, NY 10018 (212) 819-1677

Hazardous Materials Advisory Council, 1100 17th Street, N.W., Suite 908, Washington, DC, 20036 (202) 223-1271

Hazardous Risk Advisory Committee, Metro Civil Defense, Floor 7-M, Metro Courthouse, Nashville, TN 37201 (615) 259-6145

International Association of Fire Service Instructors, 20 Main Street, Ashland, MA 01721 (617) 881-5800

International Fire Service Training Association, Fire Protection Publications, Oklahoma State University, Stillwater, OK 74078 (405) 624-5723

National Agricultural Chemical Association, Tom Guilding, 1155 15th Street, N.W., Washington, DC 20005 (202) 296-1585

National Fire Protection Association Educational Technology Unit, Batterymarch Park, Quincy, MA 02269 (617) 770-3000

Private Training Firms

ALM Enterprises, P.O. Box 20912, El Cajon, CA 92021 (714) 447-2828

Center for Professional Advancement, P.O. Box H, East Brunswick, NJ 08816 (201) 238-1600

Darell Bevis Associates, Inc., Route 2, Box 311, Sterling, VA 22170 (703) 430-7100

Ecology and Environment, Inc., 120 Howard Street, Suite 640, San Francisco, CA 94105 (415) 777-2811

Emergency Action Inc., P.O. Box 10661, Charleston, SC 29411 (803) 767-0585 or (803) 553-2672

ENSAFE, P.O. Box 34207, 5705 Stage Road, Suite 224, Memphis, TN 38134 (901) 372-7962

Environmental Hazards Management Institute, P.O. Box 283, Portsmouth, NH 03901 (603) 436-3950

Fire and Safety Specialists, P.O. Box 9713, College Station, TX 77840 (409) 693-7105

Fire Rescue Consultants, 9601 Little Cobbler Court, Burke, VA 22015 (703) 451-5495

David Frank Associates, 416 S. Rolling Road, Catonsville, MD 21228 (301) 455-4510

Government Institutes, Inc., 965 Hungerford Drive, No. 24, Rockville, MD 20850 (301) 251-9250

Government Services Institute, P.O. Box 5212, Spring Hill, FL 33526 (904) 683-8553

Jerry Grey & Associates, 3554 Jefferson Avenue, Redwood City, CA 94062 (415) 864-4664

IT Corp., 312 Directors Drive, Knoxville, TN 37923 (615) 690-3211

J.J. Keller & Associates, Inc., 145 W. Wisconsin Avenue, Neenah, WI 54956 (800) 558-5011

Lion Technology, Inc., P.O. Drawer 700, Lafayette, NJ 07848 (201) 383-0800

Natural Hazards Control Institute, P.O. Box 1085, Alpha, NJ 08865 (215) 758-7045

NUS Corp., 910 Clopper Road, Gaithersburg, MD 20878 (301) 258-8763

Riedel Environmental Services, Inc., P.O. Box 5007, Portland, OR 97208 (503) 285-9111

Roberts Environmental Services, Inc., P.O. Box 10093, Eugene, OR 97440 (503) 688-4531

D.W. Ryckman & Associates, Inc., 2208 Welsch Industrial Court, P.O. Box 27310, St. Louis, MO 63141 (800) 325-1398

Safety System Inc., P.O. Box 8463, Jacksonville, FL 32219 (904) 725-3044

Safety Specialists, Inc., P.O. Box 4420, Santa Clara, CA 95054 (400) 988-1111

Transportation Skills Programs, 320 W. Main Street, Kutztown, PA 19530 (215) 683-5098

UNZ & Co., P.O. Box 308, 190 Baldwin Avenue, Jersey City, NJ 07703 (800) 631-3098

Keith Walsh & Associates, 1671 Melrose Drive, Corona, CA 91720 (714) 371-1180

University or Government Training Programs

Arizona Division of Fire Training, Office of Emergency Services, 5636 E. McDowell Road, Phoenix, AZ 85008 (602) 244-0504

California Fire Chief's Association, Monterey Peninsula College; California Fire Academy, 836 Asilomar Boulevard, Pacific Grove, CA 93950 (408) 646-4240

California Highway Patrol, Operational Planning, 2555 1st Avenue, P.O. Box 898, Sacramento, CA 95804 (916) 445-1626

Colorado Training Institute, 1001 E. 62nd Avenue, Denver, CO 80126 (303) 289-4891

Delaware State Fire School, Route 2, P.O. Box 166, Dover, DE 19901 (302) 736-4773

Florida State Fire College, Florida Bureau of Fire Standards and Training, 1501 S.W. Broadway, Ocala, FL 32670 (904) 732-0526

Iowa State University, Fire Service Extension, Ames, IA 50011 (515) 294-6817

Massachusetts Firefighting Academy, 59 Horse Pond Road, Sudbury, MA 01776 (617) 443-8926

Montana Department of Military Affairs, Disaster and Emergency Services Division, P.O. Box 4789, Helena, MT 59604 (406) 444-6911

National Emergency Training Center, National Fire Academy, Federal Emergency Management Agency, Emmitsburg, MD 21727 (301) 447-6771

National Spill Control School, Corpus Christi State University, 6300 Ocean Drive, Corpus Christi, TX 78412 (512) 991-8692

Nebraska Fire Service, 3721 W. Cuming, Lincoln, NE 68524 (402) 471-2803

New Mexico State Fire Marshall's Office, P.O. Drawer 1269, Santa Fe, NM 87501 (505) 827-4561

Ohio State Fire Marshall, Hazardous Materials Bureau, Ohio Fire Academy, 8895 E. Main Street, Reynoldsburg, OH 43068 (614) 864-5510

Oregon State Fire Marshall, 3000 Market Street, Salem, OR 97310 (503) 378-5210

Rutgers State University, Department of Environmental Science, Cook College, New Brunswick, NJ 08903 (201) 932-9571

State of California Military Department, California Specialized Training Institute, Camp San Luis Obispo, CA 93406 (805) 544-7101

State of North Carolina, Department of Insurance, Fire and Rescue Services Division, P.O. Box 26387, Raleigh, NC 27611 (919) 733-2142

Tennessee Emergency Management Agency, P.O. Box 41502, 3041 Sidro Drive, Nashville, TN 37204 (615) 741-5181

Texas Engineering Extension Service, Texas A&M University System, College Station, TX 77483-8000 (409) 845-3418

University of Kansas, Division of Continuing Education, Fire Service Training, 645 New Hampshire Avenue, Lawrence, KS 60045 (913) 864-4467

Appendix C

Information Resources

Numerous resources are available to those interested in more information about the programs described in this report. Individuals have been listed under the headings of prevention, enforcement, emergency response, training, data collection, and planning. For more general information, contact the professional associations.

Prevention and Enforcement

1. Ed Kynaston
   Commercial Vehicle Safety Alliance (CVSA)
   8751 Sapphire Court
   Elk Grove, CA 95624
   (916) 686-5008
2. Heinz Mueller
   Hazardous Materials Section
   Illinois State Police
   301 Armory Building
   Springfield, IL 62706
   (217) 785-1334
3. Paul Melander
   Manager of Transportation Investigation
   Tennessee Public Service Commission
   Cordell-Hull Building
   Nashville, TN 79896
   (615) 741-2974

Emergency Response

1. International Association of Fire Fighters
   1750 New York Avenue, N.W.
   Washington, DC 20006
   (202) 872-8484
2. George Kramer
   Tennessee Emergency Management Agency
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Appendix D

Acronyms and Abbreviations

AAR —Association of American Railroads
ABAG —Association of Bay Area Governments Administration
ATA —American Trucking Associations, Inc.
BMCS —Bureau of Motor Carrier Safety
CAER —Community Awareness and Emergency Response
CHEMTREC—Chemical Transportation Emergency Management Center
CHP —California Highway Patrol
CMA —Chemical Manufacturers Association
CSMBA —Critical Safety Management Breakdown Analysis
CTS —Commodity Transportation Survey
CVSA —Commercial Vehicle Safety Alliance
DOD —Department of Defense
DOE —Department of Energy
DOT —Department of Transportation
DVB —divinyl benzene
EPA —Environmental Protection Agency
FAA —Federal Aviation Administration
FEMA —Federal Emergency Management Agency
FHWA —Federal Highway Administration
FRA —Federal Railroad Administration
HMTA —Hazardous Materials Transportation Act
IAFC —International Association of Fire Chiefs
ICC —Interstate Commerce Commission
IDOT —Illinois Department of Transportation
MCSAP —Motor Carrier Safety Assistance Program
MIC —methyl isocyanate
MSDS —material safety data sheets
MSHA —Mine Safety and Health Administration
NFPA —National Fire Protection Association
NHTSA —National Highway Transportation Safety Administration
NIOSH —National Institute for Occupational Safety and Health
NRC —National Response Center
NRC —Nuclear Regulatory Commission
NRT —National Response Team
NTSB —National Transportation Safety Board
OHMT —Office of Hazardous Materials Transportation
OSHA —Occupational Safety and Health Administration
POEM —Portland Office of Emergency Management
PPE —personal protective equipment
PSTN —Pesticide Safety Team Network
RSPA —Research and Special Programs Administration
SHMED —State Hazardous Materials Enforcement Development
SIC —standardized industrial classification
SSRMT —State Surveillance of Radioactive Materials Transportation
STAA —Surface Transportation Assistance Act
TEMA —Tennessee Emergency Management Agency
TSC —Transportation Systems Center
TSI —Transportation Safety Institute
USCG —U.S. Coast Guard
UP —Union Pacific

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